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New Directions in Audio-Visual Communications

edited by

HENRY A. BERN

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BULLETIN OF THE SCHOOL OF EDUCATION
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NEW DIRECTIONS IN AUDIO-VISUAL COMMUNICATIONS

edited by

Henry A. Bern

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Indiana University

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VITA

Henry A. Bern

Henry Bern received his Ph.D. degree from Indiana University. He has been a Communications Officer in the Air Force, Communications Supervisor in the Veterans Administration, engineering instructor in the Sperry Gyroscope Company, research associate at the Institute of Educational Research, Indiana University, and Research Psychologist, Office of Naval Research (U.S.N. Training Device Center). At present he is Associate Professor of Educational Psychology and Research Associate in the Audio-Visual Center at Indiana University. He is a member of The Society of Engineering Psychologists, a division of the American Psychological Association.

Clarence M. Flaten

Clarence M. Flaten received his B.S. in Forestry in 1938 and his M.S. in Forestry in 1939 from the University of Michigan, and his Ph.D. from Indiana University in 1959. He was a graduate assistant at the University of Michigan in 1938-1939. He was employed in the Michigan Conservation Department from 1940 to 1942 and served as Photographic Officer in the U.S. Air Force from 1942 to 1946. Dr. Flaten came to Indiana University as Photographer in 1947 and has been Supervisor of Photography in the Audio-Visual Center since 1949. He was also Instructor in Education at Indiana University from 1949 to 1959, and is now Assistant Professor.

Carolyn Guss

Carolyn Guss took her undergraduate work at Butler University and received her Ed.D. degree in 1952 from Indiana University. For thirteen years she was a high school English teacher-librarian in Indiana. She joined the staff in the Audio-Visual Center at Indiana University in 1942 and is now head of the Selection Department and Associate Professor of Education, teaching graduate courses in the area of selection and integration of audio-visual materials. She has been responsible for building the film library at Indiana University and for directing a program of information about these materials and their educational utility. She has written numerous articles on film evaluation and selection and has conducted monthly departments--

"Audio-Visual Materials" in the N.E.A. Journal since 1952, and "New Films" in Educational Screen since 1942. Her article, "A Critical Survey of Resources for Locating and Selecting Audio-Visual Materials" in Audio-Visual Communication Review (Winter, 1955), relates directly to her report in this bulletin.

James Q. Knowlton

James Quincy Knowlton received the B.S. degree from Brigham Young University (1949) and the M.A. degree (1952) and Ph.D. degree (1958) from the University of California at Los Angeles. He was a teaching assistant at Brigham Young, and a teaching and research assistant and a University Fellow in psychology while at U.C.L.A. Besides serving in the U.S. Army, Dr. Knowlton has worked for the Los Angeles County Civil Service as a test constructor. He has taught in the University of California Far East Extension Program (in Japan, Okinawa, and Korea) and has been an instructor in psychology at Idaho State College. At present he is Assistant in Research in the Audio-Visual Center and Assistant Professor of Education at Indiana University.

Mendel Sherman

Mendel Sherman received his A.B. degree (1933) and his M.Ed. degree (1940) from the University of Cincinnati, and his Ed.D. degree from the University of Southern California in 1955. He served as teacher and principal in the Hamilton County (Ohio) elementary schools from 1930 to 1938 and in the Cincinnati schools from 1938 to 1943, and was supervisor of audio-visual instruction in the Cincinnati public schools from 1947 to 1955. From 1943 to 1947 Dr. Sherman was in military service as Officer in charge of the Film and Equipment Exchanges for the European Theater and as Motion Picture and Still Photographic Officer and Film Library Officer. While in service he was sent to Denmark on a special mission to give assistance to their audio-visual program. Dr. Sherman has been very active in the Department of Audio-Visual Instruction in the National Education Association, having served on the Board of Directors in 1957 and on the Executive Committee in 1958, a position from which he resigned in 1958 to go to Thailand for two years to serve as audio-visual consultant on the Indiana University contract to the Ministry of Education, the College of Education, and Chulalongkorn University. He has been coordinator of educational television programs both for the Cincinnati public schools and for Indiana University and is now Indiana University Area Coordinator for Midwest Program on Airborne Television Instruction. Dr. Sherman came to Indiana University in 1955, where he is Assistant Director of the Audio-Visual Center and Associate Professor of Education.

NEW DIRECTIONS IN AUDIO-VISUAL COMMUNICATIONS

INTRODUCTION

The term "audio-visual" is probably most frequently associated with educational films. As presented in textbooks, as taught in some institutions, and as supported by some research, audio-visual communication has, however, always been much broader in scope. Recent technological developments resulting in such tools as language laboratories, teaching machines, and television have tended to increase even further the breadth of the concern of this field.

This increase in breadth has been accompanied by a considerable recasting of thought and a striking out in "new directions." The purpose of this bulletin is to acquaint the reader with the effect of this ferment within the field of audio-visual communication as reflected in the thought and activities of some of the staff members of the Audio-Visual Center at Indiana University.

Overview

The preceding table of contents suggests that each contributor to the bulletin may be thought of as pointing "toward" a new direction for audio-visual concern. These directions are not necessarily typical or exhaustive of either the staff members or their efforts, and consequently no effort has been made to integrate or evaluate them at this time. The sequence of presentation is purely alphabetical, by author. In order to provide an overview of the content of the bulletin, however, a word about each author's background and the content of his article follows.

For the past 10 years (and more), H. A. Bern has been involved with technological and instructional communications. In Airways Communication in the Air Force, in the Training, Research and Development Department of the Sperry Gyroscope Company, in the Institute for Educational Research at Indiana University, in the United States Naval Training Device Center (Office of Naval Research) at Port Washington, he has been concerned with the problems of instruction and performance arising out of the engineering wizardry of our age.

In "Toward Educational Engineering" he offers support for those persons in audio-visual communication who would see themselves as technologists of the teaching profession. His article discusses

some of the qualifications of audio-visual communication to absorb and transmit to the field of education as a whole the impact of the technological revolution of our day. To provide the basis for a more critical examination and discussion to the claim of close relationship between audio-visual communication and technology, he presents evidence in relation to (1) suitability of theoretical concepts, (2) orientation of leadership, and (3) research rooted in "engineering" frameworks.

Clarence M. Flaten has been an important figure at Indiana University in relating photography to education, both as a teacher and as a technologist, since 1949. He has played an active part in the planning and producing of such nationally known educational films as Characteristics of Living Things, Mitosis and Meiosis.

As a biologist, however, he has been aware of another aspect of the use of films. This aspect appears in his dissertation for the degree of Doctor of Philosophy in biology. Recognizing the generalizability of his own applications to other fields, he points to research-film analysis and interpretation as a potential audio-visual interest. His article describes some of the limitations of direct observations and a number of studies in which these limitations have been overcome by the use of ingenious photographic techniques and equipment.

Carolyn Guss is generally recognized as one of the top dozen national leaders in the area of audio-visual communication. The range of her interests and activities as teacher, writer, lecturer, and organizational executive is both broad and deep. She is perhaps most frequently associated with her effort in selection and evaluation of educational films.

Her present concern is the lack of ready access to sources of information about instructional materials. She points to a national service as a solution to the problem.

Together with Margaret I. Rufsvold, director of the Division of Library Science, she has been working on a project for the United States Office of Education in this connection. Her article abstracts from parts of the report of this project, describes present activities, and speculates about the future.

James Q. Knowlton is a social psychologist who brings to the field of audio-visual communications a freshness of breath and breadth of other fields. His area of concentration has, in fact, been communications. Among the notable teachers with whom he worked were Franklin Fearing and Harry Hoijer at the University of California (UCLA).

In his article, Knowlton uses as a point of departure the presentations made at the Invitational Seminar of the Department of Audio-Visual Instruction (N.E.A.), 1960. He examines the more common definitions of the audio-visual field, analyzes the "rationality" of

the rationale of the field, and suggests as an alternative, a conceptural rationale "in terms of messages rather than media." Such a rationale, he says, would redirect audio-visual communication into "people engineering" and out of "gadgeteering."

Mendel Sherman is Assistant Director of the Audio-Visual Center and Indiana University's Area Coordinator for the Midwest Program on Airborne Television. He has been in the field of educational television almost from the day of its inception. In 1952 when he was in charge of educational television for the Cincinnati public schools, he coordinated and produced numerous television programs. Subsequently he coordinated or produced approximately 30 television programs for Indiana University in cooperation with the Department of Radio and Television, served as a consultant to the 1957 Hagerstown, Maryland, television workshop conducted by the Department of Audio-Visual Instruction (N.E.A.), and served in the same capacity for the Department on other occasions. He participated in the 1958 Conference on Educational Television under the auspices of the United States Office of Education and in general has continued to be active in the area of educational television. It is not surprising, therefore, that he is represented here as pointing to educational television as a direction for audio-visual interests. His article is part of a report on a recent conference on what currently is considered the imaginative project of the field of educational television--the Midwest Program on Airborne Television. It includes summaries of proceedings in which such prominent persons as John E. Ivey, Jr., Herman L. Shibler, Harold Gores, I. Keith Tyler, W. Gerald Winfield, and Edgar Dale participated.

H. A. Bern

TOWARD EDUCATIONAL ENGINEERING

by

Henry A. Bern

The linking of the fields of education and engineering in one way or another is neither recent nor novel. John Dewey did so as early as 1929 in distinguishing between the science of bridge-building or education and the art of bridge-building or education (8). W. W. Charters raised the question "Is There a Field of Educational Engineering?" in 1945, and provided a basis for antedating Dewey in his opening statement that he had been playing with an affirmative answer to this question for 20 years. (8:31) Subsequently, he did indeed answer it in the affirmative in an article titled, quite positively, "The Era of the Educational Engineer." (9) Among other examples up to the present date may be mentioned F. Bobbitt, who spoke of the "educational engineer," using the paradigm of railroad engineering as the framework for his text on curriculum (5); F. L. Whitney, who presented the role of the "educational engineer" as a consultant and cited it in his popular research text (29); and W. K. Estes, who referred to education as "this 'engineering' discipline." (12)

But these are examples essentially of a figurative linking. It would seem, however, that the Zeitgeist demands a more literal relationship between education and engineering. R. M. W. Travers expressed this in the following manner:

> It is well known that in industry there has developed a branch of knowledge, referred to as "human engineering," which serves the purpose of adapting machines to the human operator. . . . If a body of knowledge exists about the requirements, abilities and physiological properties of the human operator, machines can be designed that are well within his capacity. The design of equipment to conform to anatomical, physiological, and psychological requirements is an important aspect of industrial design and is now backed by a substantial body of knowledge; in education there are certain types of related research that must be considered at this point.
>
> First, there is the problem of designing the regular educational equipment . . . .
>
> Second, there is the problem of the design of educational equipment that is more directly related to the learning process itself. The field of education has been notoriously deficient in the development of mechanical devices that facilitate

> learning, but as Sidney Pressey has pointed out on many occasions during the last twenty years, the industrial revolution will ultimately come to education and the classroom will then be equipped with mechanisms for the facilitation of learning." (27:56) (emphasis added) (Quoted with permission of The Macmillan Co., from An Introduction to Educational Research, by R. M. W. Travers, 1958.)

Assuming that the impact of technology upon education justifies that at least one area of education be specifically concerned with the development of an engineering orientation toward the "facilitation of learning," the question arises as to which of the many branches of education may undertake this. The candidacy of audio-visual communication for this role has been suggested. Thus, according to a report in Audio-Visual Instruction, the audio-visual director has been publicly recognized as being more proficient in "educational engineering." (11) Finn claims that the audio-visual specialist is the only technologist to be found in the teaching profession. (17:22)

Such claims, however, need to be supported by reasonable arguments and evidence concerning the qualifications of the audio-visual field for this role. This article will endeavor to sketch some of the reasoning and evidence which can be brought to bear on this claim.

The argument will be made that the field of audio-visual communication is indeed a most fitting candidate because of (a) the suitability of its theoretical concepts, (b) the orientation of its leadership to engineering influences, and (c) the existence of a considerable body of research which has already been developed within an "engineering" framework. The purpose of the argument is not to prove the case, but to present it for members of the profession to refine, elaborate, discuss, and evaluate.

Suitability of theoretical concepts. In the first issue of the Audio-visual Communication Review, the question of the adequacy of existing theoretical frameworks for audio-visual communication was raised. (13) Subsequently, although many articles have been concerned with theory indirectly and some, e.g., Gibson's "Theory of Pictorial Perception," discuss an aspect of communication, the major articles that attempted to provide a theory of communication were those by Westley and MacLean in 1955 (28) and by Gerbner in 1956. (19) An analysis of these theories reveals a common framework which is suitable for an engineering orientation.

What is the fundamental nature of the Westley and MacLean model? No direct answer is provided in the article by the authors themselves. Examination of the language used to describe the model, however, reveals as key terms such words as "message," "transmission of messages and codes," "encoding," "decoding," and, above all, "feedback." Where do these concepts originate? Clearly, they do so in information theory and cybernetics.

What is the fundamental nature of the Gerbner model? Gerbner points to the origins of his model, but his referents are ambiguous. He says the model not only incorporates some features of earlier models but also adds some features of its own. (19:171) Unfortunately the 21-item bibliography contains such a heterogeneity of references that it is difficult to discern which of the references refer to previous models. Both verbal and pictorial language for key concepts, however, enables us to "place" the model--and we find that it is likewise related to information theory and cybernetics. For example, there is a section entitled "Some Examples: Mixed Sequence on Feedback" in which is described the "man-machine communication system" illustrated in his Figure 4 (Figure 1, below).

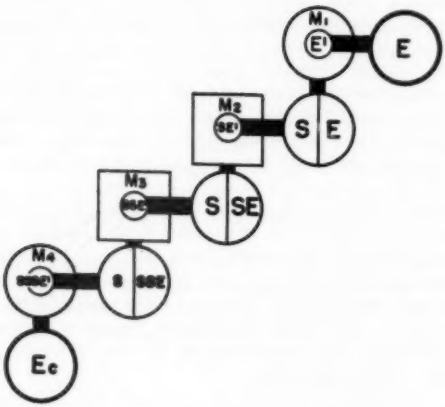

Figure 1. Communication sequence with human and mechanical communicating agents (19:181, Fig. 4)

The cybernetic concern with "automatic controls" is disclosed in his discussion of his Figure 5 (Figure 2).

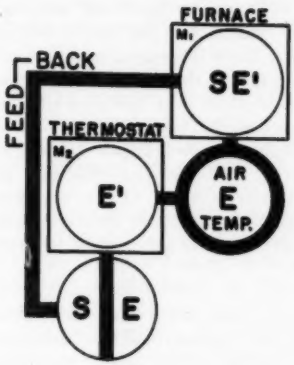

Figure 2. Automatic control: closed communication chain with feedback (19:183, Fig. 5)

The information concern is clearly indicated in the parallel comparison with the Shannon model in his Figure 9 (Figure 3, below).

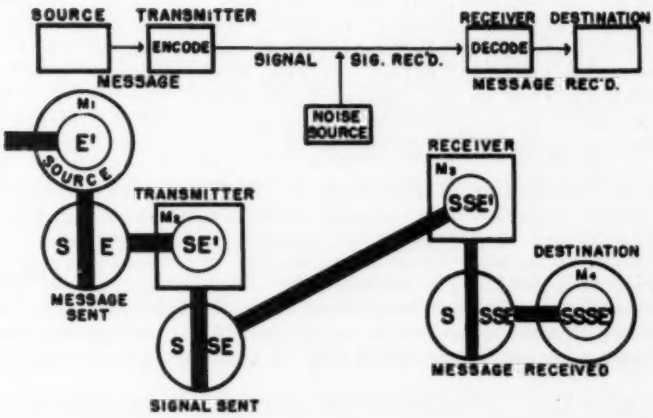

Figure 3. Shannon's diagram of a general communication system (top) compared with the progress of a signal in the same system as illustrated on the graphic model (19:191, Fig. 9)

In other words, it is suggested that the novel aspects of the communication models offered by Westley and MacLean and by Gerbner both rest upon notions which can be credited primarily to Shannon (26) and Wiener (30). Since both Shannon and Wiener are primarily mathematicians, what has this to do with the engineering orientation? It is frequently overlooked that the origin of the information theory as developed by Shannon arose in the problem of the communication engineer and that cybernetics as developed by Wiener arose in the problems of the control engineer. In the fascinating introduction to his text, Dr. Wiener indicates clearly that it is the fundamental paradigm of the engineer's servo-mechanism (and within that paradigm, the critical element of feedback) which characterizes the new point of view which links man and machine.

To summarize this section, such theories as have been advanced recently for audio-visual communication have an engineering origin, whether the authors realize it or not. The audio-visual specialist can thus be considered close to technology through the theoretical structures in his field.

Orientation of leadership to engineering influences. Although it would be interesting to make a more exhaustive evaluation of the relationship of the leadership of audio-visual communication to engineering, the manifest content of readily available public evidence for such respected figures as Finn, Allen, Hoban, and Carpenter are deemed sufficient for our argument.

It has been a rewarding experience to watch the current president of DAVI move from an assessment of the needs for the professionalizing of the audio-visual field (13) to a search for historical factors upon which to predict its future (14) to a consideration of the potentialities for good and evil of the historical factor of the "second industrial revolution" (16, 15, 25) and, finally, to an unequivocal position on the side of technology. The position is clearly stated in his redefinition of the goal of the professional AV person--"to become a specialist in learning technology" (17:22).

In the case of Allen, there is less extensive evidence; however, he had a direct professional relationship with engineering. The old masthead of Audio-Visual Communication Review has for years shown Allen to be associated with engineering organizations--first with Rand Corporation and subsequently with its offspring, System Development Corporation. According to a descriptive brochure, System Development Corporation is primarily a research engineering organization whose unique specialty is the "control system."

As a point of departure for subsequent references to both Hoban and Carpenter, it might be noted that one of the four major professional groups in System Development Corporation is the Human Factor Directorate--a group defined by its concern with the human elements of man-machine control systems. In their contributions at the

Stanford Symposium (25),* both Hoban and Carpenter reveal their sensitivity to the man-machine systems engineering approach. Thus Carpenter suggests a "systems approach" to teaching and learning:

> The general requirements are known for employing this higher order "man-machine systems approach" to the solutions of complex operational problems like those of education and including the media sub-systems. They are the following:
>
> 1. Achievement or performance goals are defined. 2. These goals are then translated into sub-sytems of general and specific functions. 3. The means of executing these functions are specified, and components of the systems are defined to include human capabilities, machines, materials and their interaction in the system. 4. Distinctions are made between those functions which can best be performed by persons with known competencies and those which can best be performed by instrumentation and materials with known characteristics. 5. Schedules and sequences of events are so planned that all components of the system, sub-systems and functions operate as required and in an orderly manner. The designed system,when tested and retested, may have its components changed or re-ordered to maximize the performance of the system as a whole in accomplishing projected goals or objectives.
>
> A systems design for an educational enterprise would provide: A conceptual framework for planning, orderly consideration of functions and resources, including personnel and technical facilities such as television, the kinds and amount of resources needed, and a phased and ordered sequence of events leading to the accomplishment of specified and operationally defined achievements. A systems approach should provide a way of checking on the relation of performances of all components to factors of economy and should reveal any inadequacies of the several components, including the faults of timing and consequently of the entire system. (25:75)

Similarly, in discussing new concepts for future research, Hoban describes and supports the "systems concept" as follows:

---

*In view of the limited current availability of this report, extensive quotations are given, with the permission of the Institution for Communications Research, from the brochure New Teaching Aids for the American Classroom (1960).

> While we have long spoken of school systems, university systems, and educational systems, we have not taken the system concept sufficiently into account in research on films or other communications media in education.
>
> . . . . . .
>
> A system can be defined as an arrangement of components with a common purpose. The importance of the system concept is in the notion of (a) components in a system; (b) the integration of these components; and (c) the increase in system efficiency achievable by trading improvement of one component against improvement of another or others. . . .
>
> . . . . . .
>
> If we are to cope adequately in educational media research and in the implementation of research findings, use of the system concept is intellectually and practically inescapable. (25:109) (emphasis added)

Subsequently, in discussing "Theory of Information and Communication," Hoban insists upon and demonstrates the technical vocabulary of communication engineering:

> It is reasonably safe to infer that the development of communication theory is an outgrowth or concomitant of the development of information theory. Certainly, all of us are familiar with Shannon and Weaver's (25) discussion of communication theory, which is still valid. However, their discussion deals primarily with the structure of communication and only by implication with its dynamics. It does not go into the characteristics of information controllable by the source or the receiver, or both.
>
> Rate, reliability, redundance, ambiguity, time-phasing, quantity, and discriminability of information are primarily source-controlled. Exposure, selectivity, capacity, receptivity, and durability of information are primarily receiver-controlled. Feedback is system-controlled. Matching the source-controlled and receiver-controlled operations is the art of communication. It is in this matching that the characteristics of the audience (the receiver) play such an important role. It is in the trade-off between production techniques and teaching techniques that difficult system decisions are encountered, since many of the characteristics of information, assigned above to source or receiver, are to some extent controllable at either pole of the communication transaction, and frequently involve or require attention and activity at both poles.

> The least that can be expected from the use of information and communication theory in media research is an improved technical vocabulary that permits the researcher to deal with relevant variables. As previously indicated, an adequate technical vocabulary is not available elsewhere. (25:110) (emphasis added)

Audio-visual research within an engineering framework. It may perhaps come as a surprise that "Instructional Film Research 1918-1950," a study which Allen says serves as an invaluable point of reference from which any later review of audio-visual research must take its direction (1:116), was executed under the supervision of a "Project Engineer" in a Human Engineering group! In the files of the U.S.N. Training Devices Center, this "bench mark" retains its humble designation "S.D.C. Human Engineering Project 20-E-4."*

From 15 per cent to 20 per cent of the entries are marked with the initials "S.D.C." in the bibliography of audio-visual communication research presented by Allen. Some of these even include the term "Human Engineering Report" (e.g. entries 11, 39, 53, etc.). Actually, most of these items, like the "bench mark" study, were done under the supervision of Human Engineering project engineers, as an examination of the title page of each report readily discloses. The above estimate of 20 per cent would undoubtedly be far greater (a) if a distinction were made between experimental studies and other types of entries such as books, general articles, etc. (e.g. entries 26, 27, 45, 49, 85, 86, etc.) and (b) if items were included for other agencies which had human engineering or human factors personnel conducting or supervising research projects, e.g. item 276 in the bibliography:

> 276. Swanson, Robert A., and Others. "Two Studies in Evaluation of Maintenance Training Devices." In Finch, Glen and Cameron, Frank (Eds.) Air Force Human Engineering, Personnel, and Training Research, ARDC Technical Report 56-8. Air Research and Development Command, 1956. p. 267-75 (1: 136). (Quoted with permission of The Macmillan Co., from the article on "Audio-Visual Communication," by W. H. Allen, in the 1960 edition of Encyclopedia of Educational Research.)

In other words, a considerable portion of the best audio-visual research can officially bear the label of "human engineering" research. Thus the audio-visual specialist is close to technology as a result of the significant research in his area.

Human engineering and instructional communication systems engineering. The terms "human factors," human engineering," man-

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*Formerly U.S. Navy Special Devices Center, whence S.D.C.

machine relationships" have appeared a number of times in the discussion above. In fact, these terms, as used by Travers and Carpenter and as related to the organizations with which Allen and Hoban have been associated, are part of the "evidence" used to support the basic argument of this paper.

If "human engineering" is accepted as the most inclusive of these terms, it can be said that it appears to be the chief agency through which the field of audio-visual research has been changing under the impact of the technological revolution which Finn describes so well. For those who were heretofore not aware of the extent of this relationship (and this is perhaps most of us!), it may therefore be well to spend a few minutes before concluding this paper to indicate briefly some further relations and distinctions between audio-visual communication and human engineering.

Like the field of audio-visual communication, the field of human engineering is plagued with unhappiness about its name. Just as audio-visual communication people have tried to find more definitive names for their field, so practioners of human engineering alternately use such terms as bio-mechanics, bio-technology, experimental psychology, engineering psychology, human factors, etc. in their search for a happy term.

In the area of more serious criteria, the basic concerns and goals of the two fields might be compared. Chapanis defines human engineering as "that branch of modern technology which deals with ways of designing machines, operations, and work environments so that they match human capacities and limitations." (7:vii) McCormick*defines it somewhat more broadly: "[human engineering] can be thought of as the adaptation of human tasks and working environments to the sensory, perceptual, mental, physical, and other attributes of people. This attribute of human use applies to such functions as the design of equipment, instruments, man-machines systems, and consumer products, and to the development of optimum work methods and work environments" (23:1). Close observation indicates that some of the concerns of audio-visual communications can be subsumed under those of human engineering. Has not audio-visual communication always been concerned with devices of one kind or another (machines if you please) to modify operation and environments in order to "match human capacities and limitations?" Consider next McCormick's statement that "in broad terms the goals of human engineering are those of human economy, or efficiency in work activities." (23:1) Have not the broad goals of audio-visual communication always included basic economy and efficiency in schoolwork activities?

What, then, is the distinction? Apart from obvious and complex differences that may be discussed on the basis of the broad distinc-

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*Quoted with permission of McGraw-Hill Book Co., Inc. from Human Engineering, by E. J. McCormick (1957).

tions between human engineering and audio-visual communication, it is suggested that a pragmatic distinction can be made on the basis of the occasion and the type in which the similar concerns of the two fields crystallized. Audio-visual communication crystallized within the field of public education about the problems of learning made uneconomical and inefficient because of the verbal and abstract complexity of the material to be learned. Human engineering, essentially a World War II product, crystallized within the field of military training about the problems of learning of a complex equipment environment. These are, of course, oversimplifications. Both fields of endeavor, for example, are developing and are extending their interests to business, industry, etc.

A convenient way of distinguishing the engineering aspect of audio-visual communication, at least by name, seems desirable. Some time ago Finn suggested that the term "communication engineering" be applied to this aspect of audio-visual communications (21:87), but this hardly seems sufficient. Even within the field of engineering proper it has been necessary to make further distinctions such as "electrical" or "electronic," or "telecommunications," etc. For the field of audio-visual, combinations of modifiers such as "training," "education," or "instruction," and "communication" or "communication-systems" readily come to mind. At the Audio-Visual Center in Indiana University, the term "instructional communication-systems engineering" has been used. Activities in this area have been defined as those in the emerging discipline of communications which are concerned with the development and application of communications theory to digital (word, number) and analogical (picture, model) information and the techniques of presenting and programming such information to structured, immediate feedback communication-systems (pupil-machine; teacher-pupil; trainer-trainee; etc.). Perhaps the simplest term however, would be audio-visual "engineering."

In conclusion, it should be pointed out that the concept of audio-visual engineering, or, more broadly, instructional-communication-systems engineering, does not imply an overnight revolution in the nature of supporting research. As indicated above, such research has been done and is being done--but not, on the whole, within the field of education. Such research originating in education may be expected to be somewhat familiar at first. Interpreted broadly, this orientation has led to the encouragement of the following problems at the Audio-Visual Center.

The Effect of Problem-Setting Questions on Rate and Amount of Learning in Programming Teaching Machines (21)

A major problem throughout education is the increasing of efficiency and economy in learning. The development of automated devices for instruction, variously called learning or teaching machines, has been predicated primarily upon their potential contribution toward a solution of this problem.

The teaching machine can be readily used however, both in this role, and in the role of a research instrument for the investigation of questions of long standing in educational methodology. One such question is that of the use of problem-setting questions. Utilizing both of the indicated roles of the teaching machine, this study proposes to examine the effectiveness of problem-setting questions in a teaching machine program as a means of increasing both rate and amount of learning.

In recognition of the significance of the "major psychoeducational issue" of individual differences as raised by Pressey, this study proposes, in addition, to test the effectiveness of the results of this procedure with superior and average subjects.

An Exploratory Analysis of Projection Standards (Screen Size, Image Size, and Image Contrast) in Terms of Their Effects on the Speed of Perception (24)

Research referring to the characteristics of the learning environment has been generally inadequate. The advent of television with its small screen, the increased use of rear projection devices, the changing characteristics of projectors and screen materials, and other technological advances have added a significant feature to the learning environment.

Because of the increased use of some materials and equipment, in what appears to be direct violation of existing standards, equipment manufacturers are questioning the validity of current standards. It is equally important, if not more so, for educators to be aware of these factors, at least to the extent that they affect learning. Most existing standards, however, have been developed without experimental support.

Although the criterion for measuring the effectiveness of the use of audio-visual materials generally is learning, it is felt that perception preceding learning is the significant point of departure for this research problem. It will be the purpose of this investigation to explore the effect of screen size, image size, and image contrast on perception as measured by reaction time.

Improving the Programming of Complex Pictorial Materials (4)

The programming of pictorial materials into instructional sequences has had to depend primarily upon intuitive judgments of the artist rather than systematic predictions of the

behavioral scientist. Research describing pictorial materials has been retarded by the enormous complexity of the task. Only recently have techniques been made available for sampling and manipulating such multidimensional materials in a controlled experimental situation.

The programmer of a pictorial sequence for a learning machine, a film strip, or a motion picture is faced with the same general questions facing the theoretician who would explain perceptual learning. These questions are generally (a) what are the ways in which pictorial materials can be varied physically to increase desired responses and (b) how do variations in presentation of a pictorial message affect responses to later messages.

Recent experimental approaches utilizing methods that allow sampling of complex pictorial variables, such as shape, are permitting experimental investigation of these questions that have so long avoided controlled study.

An Exploratory Investigation of "Sensory Image Types" in Foreign Language Learning (2)

The use of auditory, visual, and motor stimuli in foreign language teaching can be traced to the oldest times. Most recently language teachers have been availing themselves of specific visual, motor, and auditory stimuli in automatic teaching in order to reinforce the classroom experiences for the learner and to replace certain phases of conventional classroom teaching through programmed learning in the language laboratory. The use of the language laboratory as a teaching machine for individual study has, in general, been confined to the auditory medium of the tape-recorded verbal stimuli. The use of other stimulus and media combinations (verbal, pictorial, auditory, visual, and motor), however, has been suggested by Skinner, Rosselot, Mittennecker, Richter, Bauer, and others. Increased concern with pictorial materials would seem to justify the reopening of the question of "sensory image" types.

The purpose of this study, thus, is to investigate the possibility of the existence of different sensory image types in language learning. Affirmative evidence should lead to immediate benefits in the designing of language learning programs. Practically, this would mean that in a future language laboratory serving as a teaching machine, Mr. A, who may be predominantly a "visual type," has the chance to use German Elementary (GE) no. I/Visual program; Mr. B, who is predominantly an "auditory type," may use GE I/Auditory; and Mr. C, who belongs to a "mixed type," may

have the chance to use GE I/Combined. All three programs would, of course, have the same teaching objective and would cover the same material, the major difference being the emphasis and sequence of different sense stimuli.

An Experimental Exploration of Three Communicator-Strategies for Increasing the Predictability of Pictorial Cue: Verbal Response Relationships (18)

The concrete-to-abstract dimension has been a concern in research, at times in relation to the stimulus materials and at other times in relation to the verbal responses (concepts). This experimental study proposes to examine the relationship between both. The specific variables will be (a) the attributes or properties of the pictorial stimuli, and (b) the level of verbal response to the picture stimuli.

The basic question is: What communicator-strategy (general procedure for manipulating pictorial attributes) will increase the predictability of the communicatee's verbal response (i.e., predictability with regard to the relative level of the response in the concrete-abstract hierarchy)?

The study will be divided into three parts, each with a hypothesis, communicator-strategy, and set of stimuli. The three hypotheses are as follows:

a. The concrete-to-abstract level of verbal response to one pictured object will vary inversely with the overall number of attributes employed.

b. The concrete-to-abstract level of verbal response made to two pictured objects will vary inversely with the number of attributes that are similar in both objects.

c. The particular class of verbal response to a pair of pictured objects will be positively related to one of three classes--object, form, or number--depending on which set of relevant attributes has been made most "available" through manipulation.

Improving the Quality of Teacher Performance by Use of the Video-Tape Recorder (3)

Analysis of teacher performance has, of course, been a chief topic of research on teacher effectiveness; however, despite the volume of discussion, researchers have continued to utilize questionable rating scales, check lists, and

questionnaires in relatively isolated studies. There is reason, therefore, for the feeling that here researchers are no closer to the problem than they were 20 years ago.

Over 20 years ago, Barr pointed out that the complexity, uniqueness, and transience of the teaching performance requires unusual tools (providing permanent sound and motion records) for its analysis. Films and kinescopes available for some time now, however, apparently have been difficult to utilize. As Carpenter indicated recently, "films and related "media" have not yet been properly evaluated and applied as instruments of control by psychologists and other behavioral scientists." In view of the newness of the video-tape recorder, it is perhaps not surprising that it has not as yet been linked in this direct fashion to teacher training.

Recording of teacher performance is but one aspect of the problem. Improvement of performance through practice, literally, emphasizing immediate knowledge of results, is another. An abundance of research by the armed forces has resulted in impressive theoretical support of this principle as well as multi-million dollar applications of it in the form of various training methods and devices.

Stated broadly, perhaps the most significant factor in the contribution of the video-tape recorder is its potential in the improvement of communication between instructor (methods teacher) and pupil (student teacher). By providing a concrete referent to a heretofore abstract and intangible phenomenon, by permitting repeated viewing of this referent for purposes of discussion, and by providing immediate "feedback" of both verbal and non-verbal performance, an improved pupil-teacher communication system of reduced "noise" content is made possible.

REFERENCES

1. Allen, W. H., "Audio-Visual Communication," in Encyclopedia of Educational Research, edited by C. W. Harris, pp. 115-137, The Macmillan Co., New York, 1960.

2. Bauer, Eric A., An Exploratory Investigation of "Sensory Image Types," in Foreign Language Learning, Unpublished research proposal submitted to the Office of Education, Washington, D.C., July 28, 1960.

3. Bern, H. A., Improving the Quality of Teacher Performance by Use of the Video-Tape Recorder, Unpublished research proposal submitted to the Office of Education, Washington, D.C., March, 1959.

4. Black, Harvey B., Improving the Programming of Complex Pictorial Materials, Unpublished research proposal submitted to the Office of Education, Washington, D.C., July 29, 1960.

5. Bobbitt, Franklin, How to Make a Curriculum, Houghton Mifflin Co., New York, 1952.

6. Carpenter, C. R., "Psychological Research Using Television," American Psychologist 10:607, October, 1955.

7. Chapanis, A., Research Techniques in Human Engineering, Johns Hopkins Press, Baltimore, 1960.

8. Charters, W. W., "Is There a Field of Educational Engineering?" Educational Research Bulletin (Ohio State University) 24: 29-37, 56, February 14, 1945.

9. Charters, W. W., "The Era of the Educational Engineer," Educational Research Bulletin (Ohio State University), 30:230-237, December 12, 1951.

10. Dewey, John, The Sources of a Science of Education, Liveright Publishing Corp., New York, 1929.

11. "Editor's Notebook," Audio-Visual Instruction 5:34, February, 1960.

12. Estes, W. K., "Learning," Encyclopedia of Educational Research, edited by C. W. Harris, pp. 752-770, The Macmillan Co., New York, 1960.

13. Finn, J. D., "Professionalizing the Audio-Visual Field," Audio-Visual Communication Review 1:6-17, Winter, 1953.

14. Finn, J. D., "A Look at the Future of Audio-Visual Communications," Audio-Visual Communication Review 3:244-256, Fall, 1955.

15. Finn, J. D., "Automation and Education: II. Automatizing the Classroom--Background of the Effort," Audio-Visual Communication Review 5:451-467, Spring, 1957.

16. Finn, J. D., "Automation and Education: I. General Aspects," Audio-Visual Communication Review 5:343-359, Winter, 1957.

17. Finn, J. D., "Technology and the Instructional Process," Audio-Visual Communication Review 8:5-26, Winter, 1960.

18. Fleming, M., An Experimental Exploration of Three Communicator-Strategies for Increasing the Predictability of Pictorial Cue: Verbal Response Relationships, Doctoral dissertation, School of Education, Indiana University, Bloomington, June, 1960.

19. Gerbner, G., "Towards a General Model of Communication," Audio-Visual Communication Review 4:171-199, Summer, 1956.

20. Gibson, J. J., "A Theory of Pictorial Perception," Audio-Visual Communication Review 2:3-23, Winter, 1954.

21. Herrick, Merlyn C., The Effect of Problem-Setting Questions on Rate and Amount of Learning in Programming Teaching Machines, Unpublished research proposal submitted to the Office of Education, Washington, D.C., July 25, 1960.

22. Hoban, C. F., "Hope and Fulfillment in ETV Research," Audio-Visual Communication Review 6:165-171, Summer, 1958.

23. McCormick, E. J., Human Engineering, McGraw-Hill Book Co., New York, 1957.

24. Metcalf, R., An Exploratory Analysis of Projection Standards (Screen Size, Image Size, and Image Contrast) in Terms of Their Effects on the Speed of Perception, Unpublished research proposal submitted to the Office of Education, Washington, D.C., July 25, 1960.

25. New Teaching Aids for the American Classroom, Institution for Communications Research, Santa Monica, Calif., 1960, unnumbered brochure.

26. Shannon, C. E., and Weaver, W., The Mathematical Theory of Communication, University of Illinois Press, Urbana, 1949.

27. Travers, R. M. W., An Introduction to Educational Research, The Macmillan Co., New York, 1958.

28. Westley, B. H., and MacLean, M., Jr., "A Conceptual Model for Communications Research," Audio-Visual Communication Review 3:3-12, Winter, 1955.

29. Whitney, F. L., The Elements of Research, Prentice-Hall, Inc., New York, 1950.

30. Wiener, N., Cybernetics: Control and Communication in the Animal and Machine, John Wiley and Sons, Inc., New York, 1948.

RESEARCH-FILM ANALYSIS AND INTERPRETATION

by

Clarence M. Flaten

This article is intended primarily to introduce a subject which is becoming increasingly important as a research tool--the analysis and interpretation of research films.

While the concern of audio-visual communication has traditionally been the educational film, it is the research film which is our concern here. Essentially, a research film is the unaltered film footage which results from a photographic observation. It is simply a graphic film record. Michaelis describes the research film as one in which cinematography is applied systematically to the search for new scientific knowledge (13).

Although today's developments in the area of film analysis and interpretation are moving steadily forward, it is interesting to note that the very earliest uses of films were directed toward research. Beginning in 1875, Muybridge (14) studied movements in humans and animals by means of a series of 24 to 30 cameras arranged along the line of movement. His studies on the horse in motion have become classic (see Figure 1). From 1882 on, Marey (11) constructed cameras which were used for the study of bird and animal movements. By 1894 he (12) had perfected a camera which recorded 120 frames per second and enabled him to study and analyze high speed actions of animals.

The use of films for research in anthropology dates back to the work of Regnault (16) in 1895. Regnault made use of Marey's camera to record some aspects of African culture and was aware of the film as a research tool.

One of the best known uses of photography and film analysis has been in connection with X-rays. Rōntgen (17), in his first paper, discussed the differential absorption of X-rays by the different body parts, its diagnostic value, and its use in photography. This was in 1895. By 1897, MacIntyre (10) was making use of X-rays to make cinematographic records.

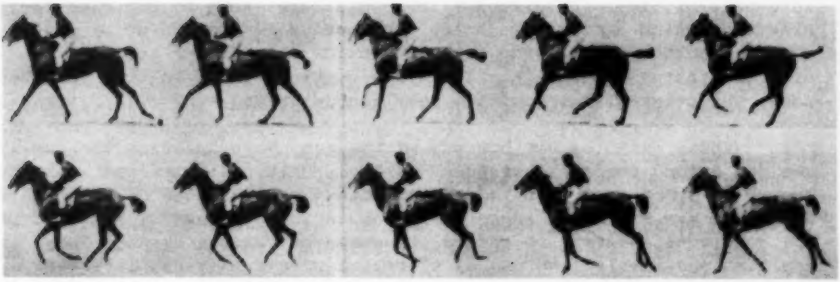

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Figure 1. Stride of a Cantering Horse*

Inadequacy of Vision

Why is film analysis and interpretation important?

Basically its importance stems from the inadequacies of human vision, some of which are well known while others are not so well known. Many shortcomings of vision are taken care of by the camera, which readily provides graphic records of many nonvisual phenomena. For example, when movement is too rapid for the human eye to follow, it sees either a blur or nothing at all, because the eye requires about one fourth of a second to register a good image. A high speed camera, however, easily records motion of exceedingly high speeds. Once recorded graphically on film, it is an easy matter to adjust the rate of image projection to a point where it is acceptable to the human eye.

On the other end of the time scale are the slow movements or changes, such as growth and slow oxidation reactions, which cannot be detected by the eye. When motion becomes very slow the eye loses the details of the mental image and, therefore, has no basis on which to compare the new image. Such slow subject changes are recorded by means of the time-lapse camera, which takes photographs at regular

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*"Stride of a Cantering Horse is shown in these photographs from Eadweard Muybridge's The Horse in Motion, published in 1878. The sequence runs right to left across the top row and continues across the bottom row. With these and similar photographs Muybridge settled the controversy of whether or not a horse 'even at the height of his speed [has] all four of his feet . . . simultaneously free from contact with the ground'." (15:148)

intervals of time. When such film records are shown by means of the standard motion picture projector, the action is speeded up or accelerated, because the showing rate is considerably faster than the original taking rate. Again the eye sees the action, in this case because the original movement has been accelerated.

These examples are but two of the many ways in which the camera can extend the range of human vision. Both are concerned with the factor of speed or rate of movement. Other applications of the camera to extend man's limited range of vision include the use of portions of the nonvisual spectrum to record phenomena of various kinds. These applications involve the use of ultraviolet rays, X-rays, infrared rays, and heat rays.

The limitations of vision, however, go far beyond rates of movement and wave length. In general most people actually see only a small portion of what is in front of their eyes and available to be seen. For example, during a spectacular football play their eyes may be intent on the halfback carrying the ball and be more or less unaware of the multitude of other happenings on the field. Part of this is due to the fact that the retina does not see equally well in all its parts. The fovea, a small retinal indentation, has a greater resolving power and sees more distinctly than the other parts of the retina. Since the fovea is very small, it provides only a very narrow field of acute vision. Thus, the muscles of the eye are constantly moving the eyeball to center the fovea over that portion of the image which is of greatest interest.

Usually, there is so much in front of the eye to be seen that the mind is not able to cope with all the items at any one time. It therefore elects to see only the items of interest, or those which are familiar. Frequently, however, unusual action, color, shapes, arrangements, etc. may attract the attention completely.

It is little wonder, then that much that is in front of one's eyes escapes the attention completely. Hyzer (8) states that it is not sound practice to rely solely upon human vision because it is influenced by both physiological and psychological factors.

Analysis and Interpretation

While the camera makes it possible to extend the range of human vision considerably, its product is a graphic record which must be interpreted with the aid of the eye. Such interpretation may follow either one of two general types, the qualitative and the quantitative, or it may combine both.

Although qualitative interpretation tends to be general, it is also highly descriptive in character and therefore has proved to be a valuable research tool. For the analysis of certain phenomena it

often turns out to be an excellent complement to quantitative interpretations.

In his qualitative studies of time-lapse research films, the author (5) utilizes the standard motion picture projector. Several techniques are employed. The usual procedure is to project at the standard silent rate of 16 frames per second. This produces an acceleration of 64x for the time-lapse photographs taken at four-second intervals. It was this technique which enabled the author to "see" the contraction phenomenon in the late prophase nucleus of Tradescantia staminal hair cells. Scientists, such as Bajer (2) working with Haemanthus endosperm and Schneider (18) with Tradescantia hair cells, have made similar observations by using cinematographic techniques. It is noteworthy that many researchers had previously studied nuclear behavior without benefit of cinematographic techniques and were unable to determine accurately the details of nuclear contraction.

Another qualitative technique used is that of reversing the direction of the projected film. This technique makes it possible for the observer to see the end result first and then trace the activity back to its origin.

It often happens that in a section of film there may be a dozen or more separate items to observe in each frame, but only one or two of the items can be observed satisfactorily at one time. In such cases, repeated showings must be made of that section of film. Also, by alternating the forward and backward projections over that section of film, it is possible to build a much more accurate picture of the small details of change and movement.

Occasionally it becomes desirable to slow the projector down to a rate of two to four frames per second or to stop it entirely to view a single frame as a single picture. One of the most advanced projectors for this type of work is the Wineberg-Watson remote controlled 16mm stop motion machine. This is a commercially available modification of the well-known Kodak Analyst projector. One of the unusual features of the modified machine is that even at slow speeds it continues to operate in a flickerproof manner. This, of course, greatly improves the viewing quality.

Recently the author had the opportunity of seeing this projector in operation at the Department of Radiology in the Strong Memorial Hospital in Rochester, New York. Considerable clinical and experimental work is going on here in the field of cine-radiography. The resulting films require as careful study as the ordinary still X-rays, hence the need for a special projector with a great deal of flexibility for detailed analysis and interpretation.

Qualitative film study is being done today in a variety of fields, particularly in sports such as football. During off-seasons and during football season weekends, both coaches and players gather around projectors to study game films in order to detect strengths and weaknesses in the play of opposing teams and players. Most

professional and college teams, and even many high school teams, are using motion pictures today as a means of improving their game.

In the fields of psychology and psychiatry there have been many qualitative studies which come under the general heading of observational research films. For example, filmed observations, such as those by Spitz (19) in 1950 and by Bowlby, Robertson, and Rosenbluth (4) in 1952, have been made of the behavior of children in hospitals.

Experimental situations have been produced for many psychological film observations. One example of such a study is that by Kellogg (9) in 1932. Kellogg reared a chimpanzee together with his own child--making many filmed observations of their comparative behaviors. He recorded the pair responding to varying types of situations and stimuli; for example, their first introduction to the ice cube.

While qualitative studies can provide much useful information of a descriptive nature, they are not numerical. Quantitative studies, on the other hand, do yield numerical results such as rate of movement, velocity, change of direction and paths of movement, displacements, etc. Such values are of great importance in research because they provide a more exacting method of stating results, of drawing comparisons, and of showing differences.

Motion picture film is readily adapted to such quantitative methods of analysis and interpretation because motion picture cameras expose film at certain specified rates of speed, i.e., 15 frames per minute, or 24 or 128 frames per second. The resulting film is therefore timed. In the author's (5) cine-micrographic time-lapse studies the photographs were taken with a time interval of four seconds between each exposure. A total of 15 pictures were thus taken during every minute of each run. If, upon examination, such a series of pictures was found to have an event which began and ended in a sequence of 60 frames of film, then this event took precisely four minutes to occur. Such an event can now be plotted quantitatively with a time base in minutes.

In order to depict the different stages that occur during cell division in the staminal hair cells of Tradescantia, the author (5) established a timing scheme suitable for graphically showing his material (Figure 2). Such a scheme made it possible to construct a visual plot of the timing in each succeeding mitotic stage as it occurred during a run. This device illustrated in detail the various untreated experimental runs which could then be easily compared (Figure 3). As the study progressed, the treated or experimental test runs were also plotted graphically and compared with the untreated runs which now served as standards (Figure 4).

Figure 2. Timing Scheme

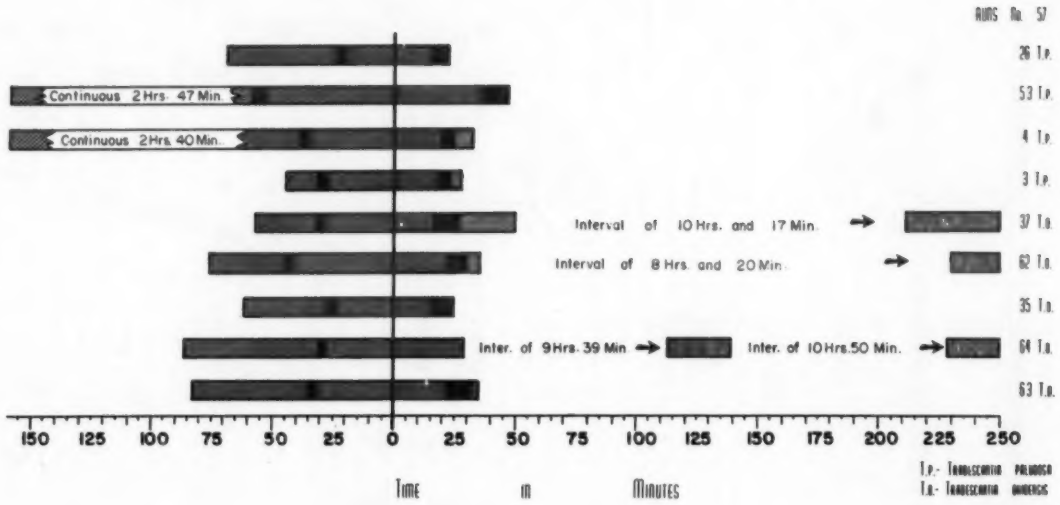
RUNS No. 57
26 T.p.
53 T.p.
4 T.p.
3 T.p.
37 T.a.
62 T.a.
35 T.a.
64 T.a.
63 T.a.
Continuous 2 Hrs. 47 Min.
Continuous 2 Hrs. 40 Min.
Interval of 10 Hrs. and 17 Min.
Interval of 8 Hrs. and 20 Min.
Inter. of 9 Hrs. 39 Min
Inter. of 10 Hrs. 50 Min.
150 125 100 75 50 25 0 25 50 75 100 125 150 175 200 225 250
TIME IN MINUTES
T.p.- TRANSECTIVA PALUDOSA
T.a.- TRANSECTIVA AMERICIS

Figure 3. Timing Chart for Untreated Runs

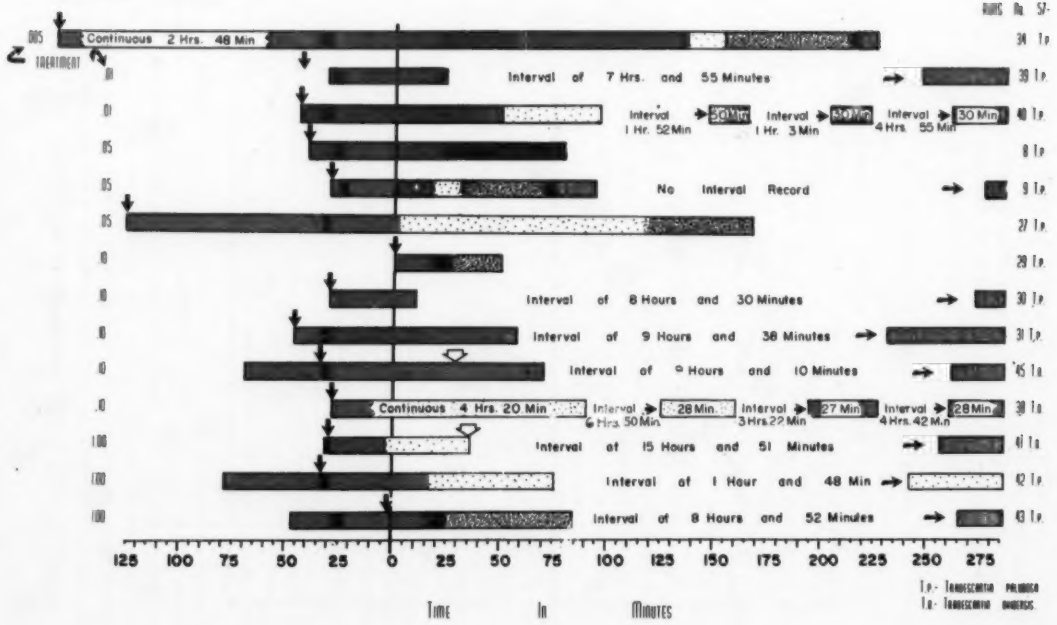
Continuous 2 Hrs. 48 Min
Interval of 7 Hrs. and 55 Minutes
Interval 1 Hr. 52 Min
Interval 1 Hr. 3 Min
Interval 4 Hrs. 55 Min
No Interval Record
Interval of 8 Hours and 30 Minutes
Interval of 9 Hours and 38 Minutes
Continuous 4 Hrs. 20 Min
Interval 6 Hrs. 50 Min
28 Min.
Interval 3 Hrs. 22 Min
27 Min
Interval 4 Hrs. 42 Min
28 Min
Interval of 15 Hours and 51 Minutes
Interval of 1 Hour and 48 Min
Interval of 8 Hours and 52 Minutes
125 100 75 50 25 0 25 50 75 100 125 150 175 200 225 250 275
Time In Minutes

Figure 4. Timing Chart for Colchicine Treated Runs

One of the events studied was the late prophase contraction of the nucleus, a phenomenon clearly observed in film projection. It seemed desirable, however, not only to note its occurrence but to time the duration of the event as well as to make measurements to show the extent or degree of contraction. This was possible because the timing could be determined from a frame count, and the amount of contraction could be determined by measuring the length of the nucleus in succeeding micrographs. A typical graph resulting from such a quantitative interpretation is shown in Figure 5.

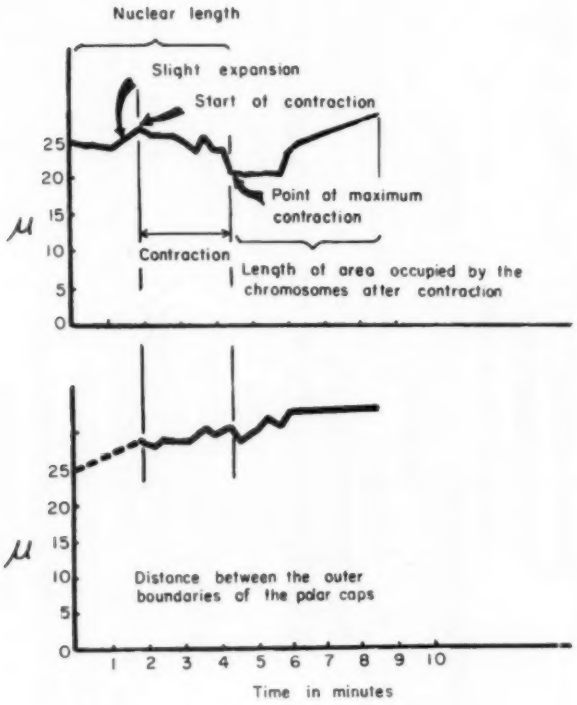

Figure 5. Graph of Prophase Contraction

Bajer (2), Schneider (18), and many other researchers in the field of biology have used the quantitative method of interpreting their research films.

Perhaps one of the most thorough quantitative film studies was made by Gesell (6) on the subject of child development. Gesell began in 1927 to investigate the behavior of children by means of quantitative cinematography. His technique of photographing children at his Yale clinic was through a screen dome which concealed the camera and observers from the baby. Gesell spent years examining in detail the thousands of individual frames from the movies. He called his technique for such study "cinemalysis."

One of the difficulties which confronts the investigator making a quantitative study from film is the method of making measurements. The technique used by the author and many others is to make small micrographs (photos) from the original film. These must all be printed at the same magnification and be kept in proper order (Figure 6). Measurements are then carefully made. Finally, such readings are plotted on the y axis opposite the correct time on the x axis. The end result is a graph which can be compared with graphs of similar pheonomena.

Today the problem of measurement is becoming greatly simplified by the use of motion analyzers. One such instrument produced by the Vanguard Instrument Corporation (Figure 7) projects the film for easy and precise reading on a tilted ground glass in front of the operator. The film can be run forward or backward at any rate of speed. It can also be stopped on any selected frame. Measurements of selected points are made by means of cross hairs which quickly determine the x and y axes. All film movements are indicated on a frame counter. Additional equipment available with the Vanguard includes devices for making angle measurements, and read-out equipment such as the IBM key punch and a memory device.

The above equipment is finding application today in such fields as medical research, missile and ballistic studies, studies on high speed mechanisms such as those reported by Hyser (8), shock and vibration investigations as reported by Hughes (7), radar evaluation, and time studies. In biology Allen and Roslansky (1) have used the Vanguard analyzer in their studies of the consistency of ameba cytoplasm and its bearing on the mechanism of ameboid movement.

Quantitative interpretations are sometimes made from films exposed as a kymograph recording. This type of film record is continuous, whereas motion picture footage, including time-lapse, is intermittent. Film recordings for this purpose were used by Bern (3) and Stevens (20) in their researches involving physiological responses. These records, like those of motion picture records, are suitable for quantitative studies because they have a time base.

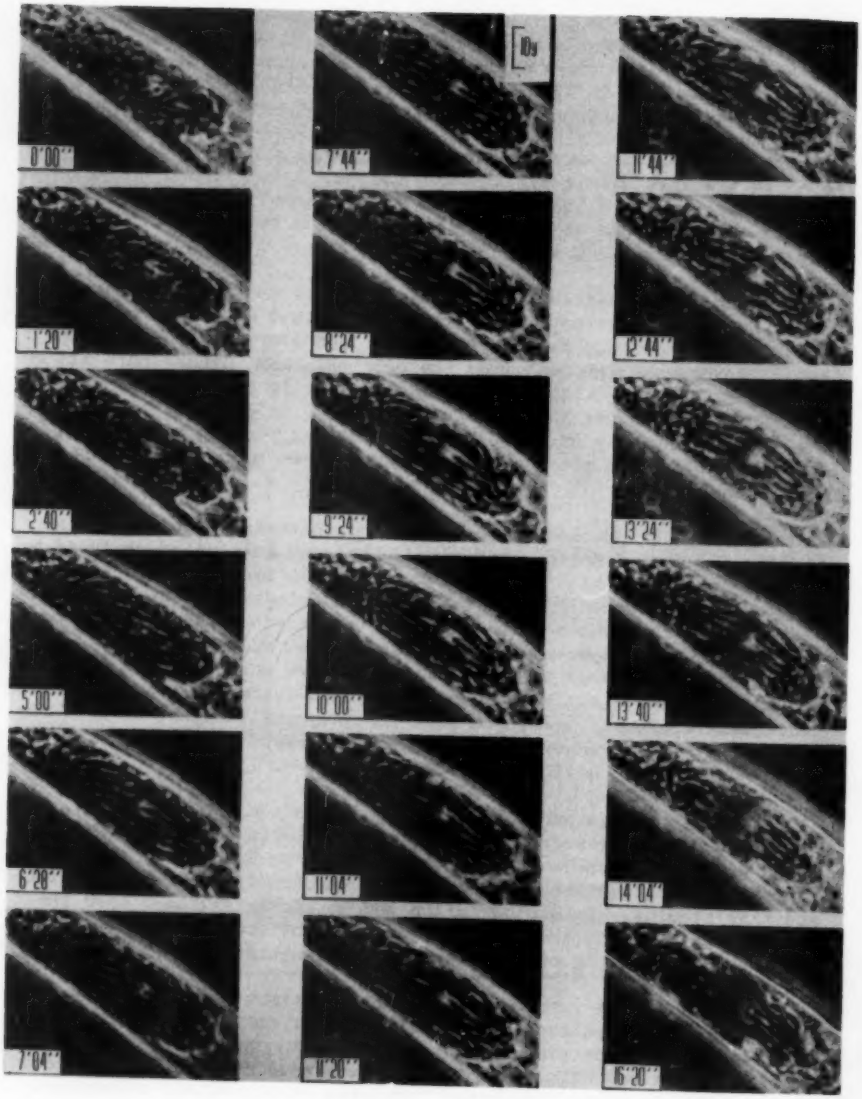

Figure 6. Timed Micro-graphs of Cell Division in Tradescantia

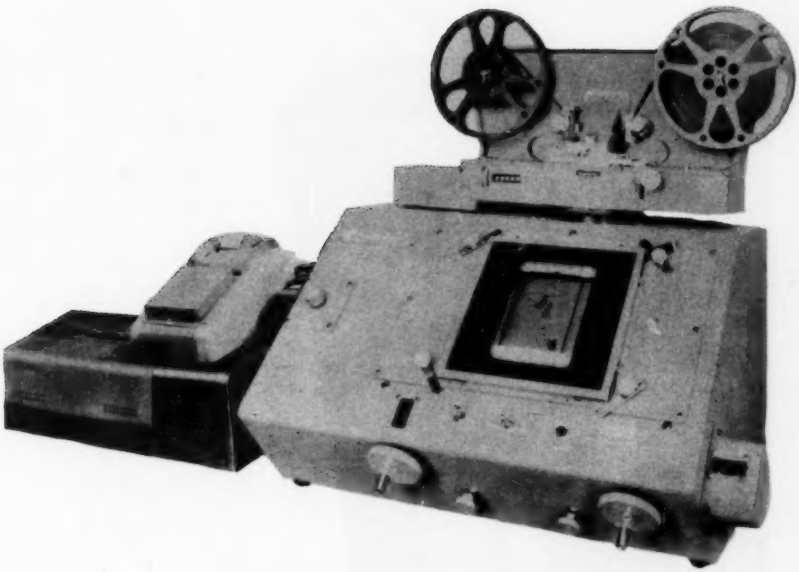

Figure 7. The Vanguard Motion Analyzer

One answer to the many types of film-reading problems is the Benson-Lehner Giant (Figure 8), a universal, semi-automatic film reader. This reader is very precise and is highly versatile, since it accommodates film records from 16mm reels up to and including 10" x 10" glass plates. Additional equipment includes various types of output such as a card punch, paper tape, or electrotyper.

Perhaps the future holds even brighter prospects for instrumentation that will read and interpret research films. The newest electronic wonder to be announced is "The Eye" (21), an optical scanner or reading machine which is already in operation. Used at present for analysis of written or printed material, its adaptation to use on research films is not too difficult to imagine.

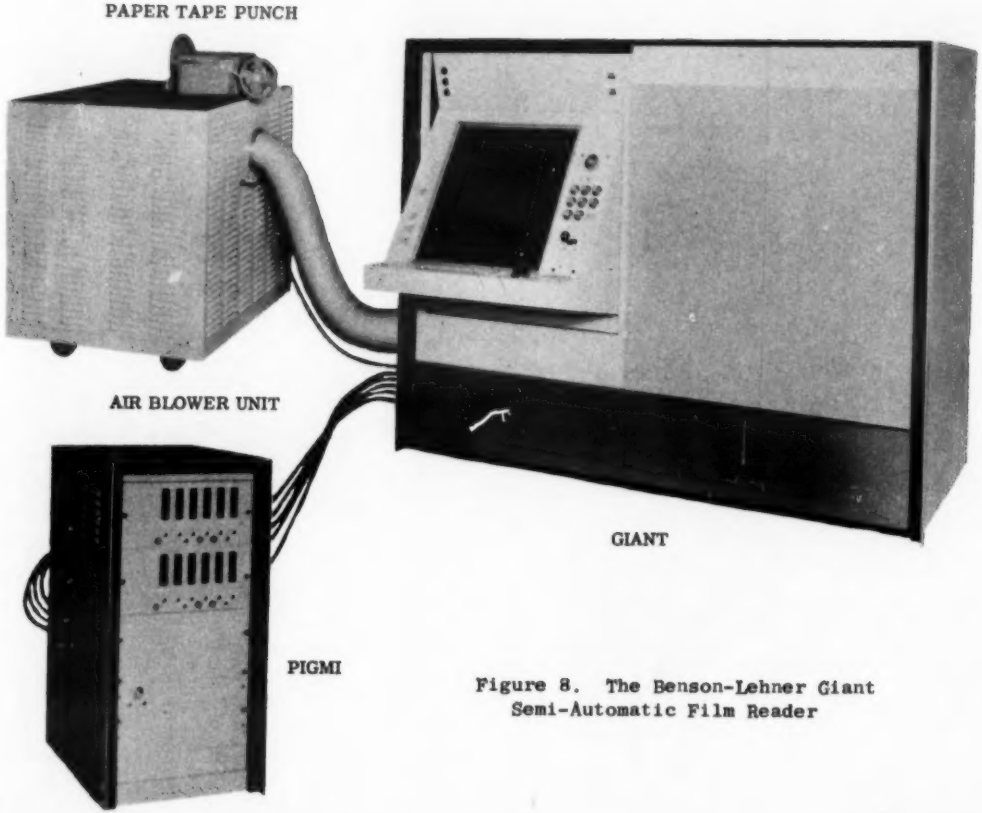

Figure 8. The Benson-Lehner Giant Semi-Automatic Film Reader

REFERENCES

1. Allen, Robert D., and Roslansky, John D., "The Consistency of Ameba Cytoplasm and Its Bearing on the Mechanism of Ameboid Movement," The Journal of Biophysical and Biochemical Cytology 6:437-446, December, 1959.

2. Bajer, A., "Cine-Micrographic Studies on Mitosis in Endosperm IV. The Contraction Stage," Experimental Cell Research 14:245-256, 1958.

3. Bern, Henry, Learning and Physiological Responses to Various Word Picture Combinations, Doctoral dissertation, Graduate School, Indiana University, Bloomington, 1958.

4. Bowlby, J.; Robertson, J.; and Rosenbluth, D., "A Two-Year-Old Goes to the Hospital," Psycho-Analytic Study of the Child 7:82, 1952.

5. Flaten, Clarence M., Cine-Micrographic Studies of Mitosis in Tradescantia Staminal Hair Cells--Treated and Untreated, Doctoral dissertation, Graduate School, Indiana University, Bloomington, 1959.

6. Gesell, A., "Cinematography and the Study of Child Development," American Naturalist 80:470, 1946.

7. Hughes, James, "High Speed Motion Pictures Examine Vibrations," in Industrial Photography, Published by Photography in Business, Inc., New York, August, 1958.

8. Hyzer, William G., "An Important Aspect of High-Speed Photographic Studies--Analysis and Interpretation," in Industrial Photography, Published by Photography in Business, Inc., New York, November, 1955.

9. Kellogg, W. N., and Kellogg, L. A., The Ape and the Child, McGraw-Hill Book Co., New York, 1933.

Some Behavior Characteristics of a Human and Chimpanzee Infant to the Same Environment. Comparative Tests on a Human and Chimpanzee Infant of Approximately the Same Age. Experiments upon a Human and Chimpanzee Infant After Six Months in the Same Environment. Some General Reactions of a Human and Chimpanzee Infant After Six Months in the Same Environment. Facial Expressions of a Human and Chimpanzee Infant Following Taste Stimuli.

Films no. 80 and 84, in Psychological Cinema Register, Audio-Visual Aids Library, Pennsylvania State University, University Park, 1932.

10. MacIntyre, J., "X-Ray Records for the Cinematograph," Archive (Clinical) Skyography 1:37, 1897.

11. Marey, E. J., "La Locomotion dans l'Eau Étudiée par la Photochromographic," La Nature 18:375, 1890.

12. Marey, E. J., "Des Mouvements que Certains Animaux Executent pour Retomber sur Peurs Pieds Lorsquils Son Precipités dune Lieu Eleve," La Nature 22:369, 1894.

13. Michaelis, Anthony R., Research Films in Biology, Anthropology, Psychology, and Medicine, Academic Press, Inc., New York, 1955.

14. Muybridge, Eadweard, "Letter to the Editor," La Nature, February 17, 1879.

15. Muybridge, Eadweard, "The Horse in Motion," L. Strandford, Boston, Mass., 1878.

16. Regnault, F., "Poterie Crue et Origine du Tour," Bulletin of the Society of Anthropology, Paris, 1895, 734 pp.

17. Röntgen, W. K., "Uber eine Neue Art von Strahlen," (translated), Science 3:227, 1896.

18. Schneider, B., "Zellteilung der Pflanzelle in Reihenbild (Beobachtungen an Tradescantia virginica)," Zeitschrift fur Zellfurschung und Mikroskupische Anatomie 28:829-860, 1938.

19. Spitz, R. A., "Genesis of Emotions, Grasping, Grief, the Smile of the Baby," New York University Film Library, New York; National Film Library, Scientific Film Library of the British Film Institute, London, England.

20. Stevens, Warren, The Occurrence of Emotional Behavior During Three Varieties of a Learning Experience with Implications for Communication and Education, Doctoral dissertation, School of Education, Indiana University, Bloomington, 1958.

21. Time Magazine, "Research and Discovery: "The Voracious Eye," Time Magazine 76:69-70, September 5, 1960.

TOWARD A NATIONAL DESCRIPTIVE AND EVALUATIVE CATALOGING SERVICE FOR NEWER EDUCATIONAL MEDIA

by

Carolyn Guss

Since it is true that the kinds of instructional materials that are introduced in the learning situation affect the learning experiences of the students (4), it is necessary that the best possible instructional materials be used and that they be consistent with the best learning theories and practices. Teachers, however, cannot use the best possible instructional materials without (a) ready access to sources of information about materials, and (b) evidence of the values or purposes of such materials.

Both the 1951 film cataloging conference held at the George Eastman House in Rochester, New York, under the auspices of the Film Council of America, and the 1953 conference on international classifying and cataloging of films held in Washington, D.C., under the auspices of UNESCO, agreed that full use of the world's resources in educational films and filmstrips is hampered by the lack of an efficient system of disseminating information about available materials and by the absence of evaluation. (3)

In 1957 Neal Miller stated in Graphic Communication and the Crisis in Education that a teacher's failure to use graphic materials is often due to the fact that information about films, even very good films, is often unavailable or difficult to discover. The report further indicated that many catalogs are inadequate in one or more respects; that they should be better indexed and organized to make it easier not only to find particular films but also to locate the right combination of films, filmstrips, and recordings; and that model catalogs should be developed and tested in different subject-matter fields. (2)

Furthermore, in 1958 Science and Film asserted that central descriptive card indexes, to an international formula, were needed for all countries, listing their natural resources in educational, scientific, and cultural films. They further stated that, until such indexes are provided, serious waste, duplication, and frustrated effort will continue and what the UNESCO General Conference in its original Resolution called 'the full use of the world's resources' will continue to be hampered. (1)

Nor is the situation improved in 1960. In fact, the situation may be even more serious; cataloging and indexing services are taxed to keep pace with the increasing number and variety of audio-visual instructional materials.

The problem: Under a contract between the U.S. Office of Education and Indiana University under Title VIIB of the National Defense Education Act (PL83-864), Margaret I. Rufsvold, Director of the Division of Library Science at Indiana University, and the author have been engaged for more than a year in a study designed to improve this situation, a study whose basic purpose is that of determining a feasible method of establishing bibliographic control of educational audio-visual materials for the purpose of informing teachers concerning available materials and their educational utility. This article abstracts reports which have been made on the research project, reports present activities, and speculates about the future. Three somewhat discrete phases were identified as composing the problem: (a) compiling an annotated index to currently available sources of information about the newer educational media, (b) determining the adequacy of such sources of information and proposing a more feasible method of bibliographic control of the information, and (c) ascertaining, from selected representative leaders considered qualified to evaluate the proposal, their reactions and suggestions for implementing either the proposed system or a modified one.

Related research. The literature and research related to this problem seemed to be divided into four major areas of concern: (a) the general problems in the field of mass communication and education, (b) the use of audio-visual materials in the school, (c) the problems and developments in the field of bibliography and documentation, and (d) the combined fields of bibliography and audio-visual materials. A bibliography of the literature and research dealing with the practices, problems, and possibilities in these four areas was compiled and studied. The publications of such organizations as the American Library Association, The American Council on Education, the Educational Film Library Association, the U.S. Library of Congress, the U.S. Office of Education, UNESCO, the National Education Association, the H. W. Wilson Company, Educational Screen and Audio-Visual Guide, the National Association of Educational Broadcasters, and Eastman Kodak, and of such individuals as Catherine Williams, Vera Falconer, Max Bildersee, Bertha Landers, and William Hartley make significant contributions to various aspects of the problem. There is, however, no single study or service which deals specifically with the problem of complete bibliographic control of newer educational media.

Current indexes and services. In a 152-page report entitled Sources of Information About Newer Educational Media for Elementary and Secondary Education (1959-1960), made to the Office of Education in the U.S. Department of Health, Education and Welfare, April 20, 1960, the investigators identified a total of 174 sources of information which met their criteria for consideration. Of these, 78 were newer media catalogs and lists which were generally available and therefore were fully described and annotated in the report; 52 were newer media catalogs and lists which were either out of print or unavailable and therefore could not be annotated; 11 were periodicals concerned with the newer educational media; 28 were periodicals which regularly reviewed newer educational media; and five were professional

organizations concerned with all facets of the newer educational media. An analysis of these various sources revealed that there is no comprehensive or complete bibliographical service covering the newer educational media; therefore, there are no reliable figures concerning the number of titles available in any of the media at the present time or concerning the total number being produced and/or distributed in the United States annually, nor are there comprehensive subject indexes or cross-media indexes to the total field.

The most comprehensive and systematic bibliographic services currently available for motion pictures, filmstrips, and phonorecords are the Library of Congress catalogs, Motion Pictures and Filmstrips and Music and Phonorecords, and the H. W. Wilson Company's Educational Film Guide, and Filmstrip Guide. There is much duplication between these two services in the listing of films and filmstrips. There is also widespread duplication of listings in the above catalogs and in free catalogs of producers, distributors, and libraries. The latter were not considered in the survey of sources for this very reason.

Other multi-subject but more limited services are the Blue Book of Audio-Visual Materials (Educational Screen, Inc.); the EFLA Evaluations (Educational Film Library Association); U.S. Government Films for Public Educational Use (U.S. Office of Education); Films for Public Libraries (American Library Association); the Audio Cardalog (Max W. Bildersee); the Educators Guide to Free Films, Educators Guide to Free Filmstrips, and Educators Guide to Free Tapes, Scripts and Transcriptions (all from Educators Progress Service), the Landers Film Reviews (Bertha Landers); and Children's Record Reviews (Box 192, Woodmere, N.Y.). Two catalogs with no counterparts are Educational Television Motion Pictures, 1960 Catalog (NET Film Service, Indiana University Audio-Visual Center) and the National Tape Recording Catalog (Department of Audio-Visual Instruction, National Education Association; Association for Education by Radio-Television, and more recently the National Association of Educational Broadcasters; and Kent State University).

An analysis of the subjects covered in the 62 catalogs which limit their scope to special subjects reveals that the broad areas of music and foreign languages, with four and five lists respectively, have the greatest number. Only one special list is concerned with the broad field of science, although there are lists dealing with the more limited areas of agriculture, atomic energy, aviation, electricity, gardening, medicine, mental health, and natural resources. The subject lists vary greatly in size and completeness of content, from the four-page list on gardening to the larger compilations on world understanding and democracy. The obvious difficulty with these lists is that the teacher, librarian, or other new media user cannot rely on a special list for each area, nor do all lists contain the same descriptive-evaluative information. Furthermore, most of these are once-only publications, with no provision for keeping them up to date.

Over 50 titles of newer educational media lists or catalogs which have appeared since 1950 are already out-of-print or unavailable.

This figure represents two thirds of the number of such lists which are currently available and which were published during the same 10-year period.

By consulting all of the 78 currently available tools, the new media user can locate a large number and a wide range of the resources which are available; but the cost in time and effort, the duplication, and the frustrations are a genuine deterrent to the educational use of these media. The purchase cost alone--from $125 to $200 annually--is prohibitive for many schools and libraries. When one adds this cost to the unknown cost involved in producing all of these various tools and catalogs, it becomes apparent that large sums of money are expended annually for services which are not satisfactorily meeting the needs of the public schools.

Proposed system. In a 29-page May 14, 1960, report, the investigators recommended that essentially three services will best meet these needs: Part 1, a national descriptive catalog service covering the newer educational media by individual type and collectively by type on a cross-media basis; Part 2, subject and/or grade-level lists of materials containing, in addition to the descriptive data provided in the foregoing service, recommendations concerning teaching purposes, specific strengths and weaknesses, actual or anticipated student questions and responses, suggestions for integration with other instructional materials, and a brief comment concerning technical qualities; and Part 3, a newer educational media information bulletin. All three of these services should, of course, be available, as conveniently and inexpensively as possible, to every classroom teacher. These three services are described in some detail as follows:

Part 1. National Catalog of Newer Educational Media

This national catalog would provide a service presently available through Library of Congress catalogs, H. W. Wilson publications, producers' catalogs, and others. It could supersede or become a combination of some of the existing services, could provide a more frequent and complete source of information, and could avoid costly duplication of effort and expense.

Scope. The service should include initially all of the following, which are educational in character and are produced and/or distributed in the United States:

Motion pictures (16mm)
Filmstrips
Nonmusical phonotapes
Nonmusical phonodiscs

It should include other new media such as 8mm motion pictures, 2" x 2" slides, and video tapes as availability and use justify.

Entry. Complete bibliographical information and a descriptive annotation should be provided for each entry.

Frequency. The basic catalog should contain titles generally available at time of publication, followed by:

Monthly supplements
Annual cumulations
Five-year cumulations

Arrangement. The national catalog should be divided into sections, with a separate section for each medium arranged alphabetically by title with each title numbered, and with a subject and author (when cited) index to each section and a cross-media subject index to all sections. Subject indexing should be very thorough and detailed, referring to titles by number rather than by page number.

Card service. Catalog cards should be made available for each title on a basis similar to the Library of Congress catalog card service.

Subscription fee. This comprehensive bibliographic service should be made available at a nominal cost.

Part 2. Guides to Selected Newer Educational Media: Subject Lists and/or Grade Level Lists with Critical Appraisals

Scope. These catalogs should include motion pictures, filmstrips, and nonmusical phonorecords.

Entry. Each entry should be fully described and appraised. Critical appraisals should be prepared by representatives of such associations as the Modern Language Association, the National Council of Teachers of English, the National Council of Teachers of Social Studies, etc. as well as by specialists in the instructional materials area and, if feasible, by students for whom the material was designed. Suggestions or guide-lines to be used by evaluators in appraising the newer media in terms of their educational utility, and a system for reporting same, are implied. Help along these lines is available from the publications of associations and individuals who provided the bibliographic services described in the investigators' April 20 report.

Frequency. The catalogs should be kept up to date with quarterly supplements and should be cumulated periodically.

Arrangement. The main body of the catalogs should be arranged alphabetically by title, with detailed subject indexing using the cross-media approach.

Part 3. Newer Educational Media Information Bulletin

> Published monthly during the school year, this publication would provide a clearing house for information about educational radio and TV as well as about other educational media as they relate to school use.

The proposal was presented by the investigators to more than 30 individuals who either affect or are affected by such a proposal in various ways. All agreed that there is a need for a systematic bibliographical control. Many felt that the current economic waste and confusion regarding newer media amounts to a national disgrace and that the existing chaos can no longer be tolerated. Others felt that Part 1, while desirable, was also idealistic and difficult to attain. One person frankly saw no solution and felt that producers and distributors would need to do a better "selling" job, particularly through direct contact with elementary school and secondary school teachers. It was recognized by most persons that a feasible bibliographic service would have to be subsidized in its initial stages, and it was suggested that funds for this purpose be provided by the Newer Media Branch under Title VII, Part B, of the NDEA. One person suggested that the support should come from a foundation. It was assumed that, under existing laws, the Office of Education would not have the authority for conducting the bibliographic service, but that this agency could provide for its implementation through contractual arrangement with some other agency or organization.

The discussants were very favorable in their reactions toward detailed subject indexing using the cross-media approach, and they felt certain that many valuable educational media resources are not now being used because their existence is unknown.

There was general agreement that the national catalog of newer educational media should include all motion pictures (16mm), filmstrips, and nonmusical phonorecords which are produced and/or distributed in this country and that it should omit musical phonorecords and 35mm motion pictures. Several persons felt that 2" x 2" slides should be included, but others stated that this category does not warrant inclusion, for the present at least. All agreed to the desirability of making the service available on catalog cards as well as in book form.

The need for both Parts 1 and 2 in the proposal was questioned by a few of the authorities; it was suggested that the two parts might be combined, with critical appraisals included for only those items recommended for school use. Others objected to this method as being too slow and cumbersome and as attempting to serve too many purposes simultaneously. A few persons objected to catalogs designed for particular educational levels (Part 2) and preferred subject lists covering the whole range of grade levels. One suggested solution was that these catalogs (Part 2) be varied to suit the wishes of the subscribers by printing the appraisals on cards similar to the present EFLA cards; sorting them by broad subjects, specific subjects, grade

levels, and other categories; and then reproducing quick and inexpensive offset lists from the cards. The cross-media indexing for these lists would add considerably to their initial cost, yet would be important features. One of the discussants felt that most users would prefer that the guides to recommended educational media cover all subjects in one catalog. He added, however, that objections to this system might be overcome if the various available evaluative guides manage, between them, to cover evenly all of the subjects of educational interest and if the guides could all, as a group, be made available on a continuing subscription basis.

While most persons agreed that critical appraisals of the media are needed, there was disagreement about the method of assuring systematically produced, high quality reviewing. Hundreds of teachers, subject specialists, and instructional media specialists throughout the country perform this service voluntarily now, usually without charge. They would undoubtedly donate their services and report student reactions to any agency which would, in turn, channel this information to other users. While this reservoir of free talent is a valuable resource, it was pointed out that it would cost as much to utilize this talent as it would to employ a staff of competent reviewers. A compromise between the two extremes would be to employ both an editor or editorial staff and groups of qualified teachers who could appraise newer media (which had accumulated during the previous nine-month period) at a central editorial office during summer vacation months. This type of institute would provide excellent in-service training for teachers in addition to providing a product of educational significance.

There was general agreement among the authorities concerning the need for Part 3, a newer educational media information bulletin, particularly to disseminate information about the latest programs and developments in the media of radio and television. It was suggested that this bulletin could be published by the Newer Media Branch, by the agency which provides the services proposed in Parts 1 and 2, or by some other agency designated by the Newer Media Branch.

Conclusions and Future Plans. The experiences of the investigators in conducting this research study, their years of experience and interests in the area of the problem, and the evidence presented in the reports seem to justify the following conclusions:

1. To locate information about available audio-visual materials relating to a particular subject and grade level is a complicated, difficult, and time-consuming task.

2. Information concerning 16mm motion pictures is more generally available than information concerning such other media as phonorecords, slides, filmstrips, radio, and television.

3. Even in the case of films, most descriptions treat the entire film and do not provide efficient indexes to individual sequences or sections within the film.

4. Bibliographic services covering the newer educational media, as well as the interest in and need for such services, are increasing rapidly.

5. The retrieval of information recorded in the form of any of the newer media is not only a national problem but also an international one. Such international organizations as UNESCO and the International Scientific Film Association recognize this as a problem.

6. It is the hope of many that the process of locating and procuring appropriate audio-visual materials will be simplified and improved.

As the amount of knowledge in the world increases and as it becomes important for citizens in a democracy to know more and more, the need for improving educational resources becomes more acute than ever. It is felt that the proposed national system of bibliographic control of information about the newer educational media will have the following values:

1. By cutting across the single medium lines of demarcation, it will contribute to the cross-media approach to learning and the integration of wide and varied experiences into a higher order of relationships.

2. It will facilitate classroom teachers' selection and use of the newer instructional materials by making information more widely and easily available.

3. It will eliminate needless overlapping and duplication of bibliographic services where such exist and will fill in the gaps which now exist.

4. It will contribute to a more effective coordination and integration of the efforts and services of those agencies concerned with improving education through the production, distribution, and use of audio-visual materials.

5. It will allow for increased interaction among those affecting and affected by educational practices and thus should result in increased understanding of the role of materials as a source of educative experiences.

6. It will contribute to the improvement of instruction and learning in schools throughout the nation in all subject-matter fields on both the elementary and the secondary levels.

The investigators are currently involved in selecting and inviting approximately 30 individuals recommended as outstanding in the field of storage, retrieval, and dissemination of information as well as those who represent newer education media consumer, producer, and distributor experiences and interests to a conference to be held on the Indiana University campus, October 5-7, 1960, for the purpose, as mentioned earlier, of reacting to the method of bibliographic control proposed above and of recommending to the U.S. Office of Education the most feasible method and possible ways of implementing it. Miss Rufsvold and the author will prepare the report of the conference.

The work done at Indiana University not only by the investigators in this study and the departments they represent but also by a large number of faculty members and alumni has undoubtedly contributed in no small way to the progress that is being made in this area and may, in the future, be recognized as having been a vital factor in establishing adequate bibliographic control of the newer educational media.

References

1. "A Plea for National Indexes," Science and Film 7:28-30, December, 1958.

2. Miller, Neal E., "Barriers to Optimum Use and Suggestions for Overcoming Them," in Graphic Communication and the Crisis in Education, pt. 1, pp. 3-58 (Audio-Visual Communications Review, vol. 5, no. 3, 1957).

3. Morsch, Lucile M., "Cataloging" in Sixty Years of 16mm Films 1923-1983, Film Council of America, Evanston, Ill., 1954.

4. Witt, Paul W. F., In-Service Education of Teachers in the Use of Audio-Visual Materials of Instruction, Doctor's Thesis, Teachers College, Columbia University, New York, 1947.

THE NEED FOR A CONCEPTUAL RATIONALE FOR THE AUDIO-VISUAL FIELD

by

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The view I shall defend in this essay is that the definitions of the audio-visual field most generally offered are totally inadequate; that the conceptual rationale usually offered is indefensible; and that a logical and formal definition and rationale are prerequisites to significant research in the audio-visual field.

More specifically, I shall urge that the A-V field's commonly stated "conceptual rationale," which stresses the strengths of the concrete and the dangers of the abstract learning experience, is more properly of the order of a definition of the field; and that once a definition of this ilk comes to be generally accepted, a sounder conceptual rationale--one in terms of messages rather than of media--will almost certainly obtrude itself.

A-V Aids or A-V Communication?

The audio-visual field has suffered through a plethora of names. Most recently, audio-visual "communication" has supplanted such names as audio-visual "aids." This seems to have resulted in part because some of us have at times appeared to be more concerned with our machines than with what our machines are for, and this has prompted detractors among us to hurl the epithet "gadgeteer" at us. By adopting a communication orientation, thereby placing the emphasis on the function of our machines, we have intended to give notice to these detractors that we are concerned with more than media and that we are very much concerned with messages as well.

Still, our name change has not been accompanied by a sharpening of our way of conceptualizing our function. We have, in fact, been guilty of verbalism. We have given ourselves a new name, we are communicators. And yet we seem not to know what we wish this name to signify. We recognize that a concern with communication puts emphasis on how messages affect behavior, but we still concentrate on the machines that funnel our messages more than we concentrate on the messages themselves. And despite our statements that we are communicators, we avoid defining this key term; rather, we describe the A-V field by inventorying its machines.

Despite this appearance of a machine fetish, we do not give an academic degree to the student who can thread a projector with unusual speed, for we do not ordinarily consider our field to be one that is primarily concerned with physical dexterity. Nor do we give degrees to persons who can name a sufficiently large number of audio-visual machines in a prescribed length of time. We do not even give degrees to persons chiefly because they have learned to shoot a very fine picture or to produce an excellent film (though this is surely important). We do give degrees to the student who has learned the principles of effective teaching (communication) and can apply them. I suggest that in the audio-visual realm it is eminently reasonable to expect students to be aware of the special strengths and uses of the audio-visual message in the teaching enterprise. But we can hardly require this until we can say what an audio-visual message is, and what its peculiar strengths and weaknesses are. Moreover, an audio-visual message can never be usefully defined so long as its definition is in terms of the machines that funnel it.

But am I setting forth a straw man for easy later destruction? Can it be true that the audio-visual field lacks a reasonably adequate definition? Is it at all possible that we are unsure of the precise characteristics of what we call an "audio-visual message"?

Some hint of the difficulties we face is to be found in an often quoted article by Finn (10), in which the need to adopt a communications orientation was set forth. Of significance is the fact that, while forcefully urging a communication orientation, Finn failed to define "communication" even vaguely. Rather, he quoted John Dewey who showed that the term had a common parentage with "community," and he left the matter essentially at this, every bit as broad as all that is social. One may, of course, question the need to define such a commonly used term as "communication," but evidence that this need exists is most abundant.

One has only to examine the broadness of the topic as revealed in the five chapters devoted to the subject in The American Handbook of Psychiatry (2); to appraise the non-behavioral use of the notion made by the "information theorists" who are not interested in information as we know it, in human encoders or decoders, or in meaning (see 6); to explore the ramifications of the subject revealed in the 209 references to the term in the multiple author publication entitled Small Groups (13); to look at Paul Farnsworth's interpretation of communication in his chapter on "Language Aspects of Music" in his Social Psychology of Music (9); and to view the animal communication approach by Hebb and Thompson (14), the art approach to the subject by Kepes in his Language of Vision (17), or the approach of the psycholinguist and the anthropological linguist (15).

The Encyclopaedia Britannica has a reading guide series, one of which is entitled Modern Communication. (21) Some reference terms that this guide lists as keys to the volumes of the encyclopaedia are: "alphabet," "education," "ideograph," "palaeography," "philately,"

"propaganda," and many others. No reference is made to "audio-visual" *per se*, but Dale's *Audio-Visual Methods in Teaching* is referred to, along with books having titles like *Second Phrase Code* and *Sea Signalling Simplified for the Merchant Navy, Fishermen, Yatchtsmen, Sea Cadets*, etc. Clearly a term that has as widely varying significations as "communication" can be of little use until it is carefully defined.

Definitions of "audio-visual communication." The bare terms naming our field at various times over the years also present quite a little variation. Some examples are: "visual aids," "visual-sensory aids," "perceptual learning," and "audio-visual education." In 1952, when the official publication of DAVI became *Audio-Visual Communication Review*, our field came to be called "audio-visual communication."

If we look more than glancingly at our past names, there is something of the tautological or ubiquitous in each of them. "Visual aids" not only denote eye glasses, but the printed word. Changing this term to "visual-sensory aids" only adds a tautological touch. And "perceptual learning," it seems clear, eliminates little in addition to deductive reasoning. "Communication," it has already been suggested, is the most ubiquitous term of all. Despite rather wide acceptance, this term has remained undefined in the writings of audio-visualists, although the latter have grappled with the "audio-visual" modifier. To define a modifier and not that which is modified is, of course, a little strange; and yet this has often been done. Allen, for example, has recently defined audio-visual communication as referring "to such special kinds of communication devices and procedures as motion pictures, filmstrips, television, radio, recordings, graphic illustrations, school journeys, models, and demonstrations." (1:5) He did not define "communication"; rather, he defined our field by preparing a list of some of its machines.

In failing to take cognizance of the critical term in the phrase "audio-visual communication" (viz., "communication"), Allen becomes an unwitting accomplice working for our field's destruction. To conceive of the A-V field in the manner he has is to insist on a built-in obsolescence. For in this view, when the materials concept goes, so does A-V as defined above; and Finn (11) has already frightened his emotional Rousseauians by calmly asserting that the materials concept is even now out of date and chiefly of interest to the historians of education.

Technicians who attend to the media to the almost total exclusion of the people the media connect are badly needed specialists who are fulfilling a necessary role. But it is important to remember that they are not educators. Of significance in this connection is Ford Lemler's (19) remarkable defense of the practitioner on a morality basis. His view? "It is no sin to be a practitioner." I believe most of us are against sin and for practitioners, but Lemler misses the point as far as the educator is concerned. The M.D. is a practitioner and sinless--being almost a god in contemporary American culture. He is not usually labeled a "gadgeteer," though he might

well be, as "gadgeteering" is required of him. He is master of the opthalmoscope, the sigmoidoscope, and the sphygmomanometer. If he is like we want the audio-visual professional to be, he keeps his "gadgets" in good repair, but he is not preoccupied with them. He is, rather, preoccupied with his patients. I believe the audio-visual professional who is an educator is also preoccupied with his pupil-patients--in particular, with the best means of establishing common-ages between his own and their nervous systems.

Allen's definition, especially when considered in the light of Lemler's statement, points up the confusion that arises from our failure to define our field other than in terms of its machines. How very strange that, after changing our name from "aids" to "communication," we still define ourselves by inventorying these machines.

Another source of confusion arises from the fact that in the past we have not adequately defined even the "audio-visual" modifier. We early defined "audio-visual" tautologically as referring to those messages received by means of the eyes and/or the ears. In thus particularizing our special communication interests as "audio-visual" we have embraced all of communication, but without knowing it. This results because the eyes and the ears are the only exterceptors possessed by man that can be activated over any great distance and that allow for great speed and fineness of decoding. If half the world had eyes and ears, and if half had neither, as was true of Helen Keller, we might with some justification speak of audio-visual communication on the one hand and of tactual-olfactory communication on the other. Lacking such a contrasting group of tactual-olfactory communicators, the term "audio-visual" as a modifier of "communication" is not definitive in the least. I hope so far to have made the point that we have not thought clearly about what we wish the phrase "audio-visual communication" to signify. Next, our use of the abstract-concrete dichotomy as a rationale involves us with another primitive, undefined conception.

"Concrete Experience": Rationale or Definition?

The conceptual rationale for our field that is most in evidence is one which stresses the virtues of "concrete experience" as opposed to "abstract experience" and that decries what is called "mere verbalism." Gerbner called this rationale a rationalization and thoroughly disclaimed it. His comment is worthy of some consideration:

> The conceptual rationale most widely held by a-v practitioners is not a rationale at all but a rationalization. "Abstract verbal labels" may be empty without "rich sensory experiences" (although no worse than the other way around); but the mechanical application of the dubious dichotomy between the "abstract" and the "concrete" to the ordering of

> media and channels of communication into a hierarchy is a ritual which--as indeed the very name of the tribe--blocks our attempts at clear thinking. (12:5)

I have to agree with Gerbner in light of the usual "machine inventory" definitions of our field and our field's rationale in terms of "the concrete experience." But if we reconceptualize a bit, quite a different picture presents itself.

My view is that our abstract-concrete rationale comes close to being of the nature of a definition. Indeed, some recasting is necessitated to secure the change-over, but the new form will, I shall argue, directly point up a more rational rationale. This recasting falls in a later section, however, because some preliminary deliberation on the nature of the concepts of sign and of the abstract-concrete continuum is a prerequisite.

I find it an odd, yet understandable, fact that the audio-visualist stands almost alone at the shrine of the god named "Concrete." Most students of language have worshipped at the shrine of the god named "Abstraction." Roger Brown comments most interestingly on this subject. He points out that students of language have typically made use of the distinction between the ability to make abstract, as opposed to only concrete, reference. For example, animals more than man, children more than adults, aphasics and schizophrenics more than normal persons must depend upon concrete modes of thought. Animals, children, and the brain-damaged are thus limited in their problem-solving capacity by the immediate, concrete, sensory environment, but normal human adults can transcend the concrete facts of the immediately given reality by adopting the abstract attitude; an ability dependent upon the use of abstract language signs.

Such a progression is visible in the development of written language. The earliest forms of writing used signs that were schematic representations of things they stood for. But, since it was not possible to so represent ideas lacking "thing character," ideographs were developed. The culmination was reached with alphabet writing, for this made it possible to refer to highly abstract ideas and "things" with equal facility and with a very small number of characters (e.g., the 26 letters of the English alphabet).

From such observations students of language have called attention to an important generalization that problem-solving ability is positively correlated with linguistic progression (from concrete to abstract) and inversely correlated with the progression of diseases causing brain damage. Little wonder, then, that language students, if not audio-visual students, have chosen the god named "Abstraction."

It is understandable that the teacher of young children (in light of the comment above) should early detect the villain to be christened "Verbalism." It is not so understandable that the teacher

who is verbalism's stoutest antagonist, the audio-visualist, should find it so difficult to discern the camouflage of verbalism's twin devil, whose name is "Pictorialism." Dale (7) seemed aware of this second devil, but not sufficiently to Christianize him with a name, as Brown, Lewis, and Harcleroad (4) have recently done. It is not true, moreover, that the pictorial is inevitably real and rich and concrete. It can be highly abstruse, abstract, and noisy. The abstract-concrete dichotomy leads us into error, because it is no dichotomy (we mostly recognize this), and also because both verbal and pictorial signs vary along an abstract-concrete continuum.

Figure 1 illustrates some of these points. This figure, reminiscent of the verbal abstraction ladders of the general semanticists, is an abstraction ladder that is both pictorial and verbal. Moreover, the pictorial and the verbal are ends of a single continuum representing but one concept, that of man. The four pictorial representations of man to be found in the four corners of the upper portion of the figure represent men from widely differing cultures. Toward the center, some of the differences between the pictographs of these four men are eliminated, while the similarities are abstracted out and retained. The center pictograph of man--a stick figure--is highly abstract and representative of man in general. Beginning with the stick figure, A, the continuum blends from the pictorial into the verbal; and the verbal, or written forms (B, C, and D), show the way the Chinese have written "man" at different periods in the development of their written language. An early form is shown in B, where the sign for man is rather clearly like a man, though highly schematized. Over time these signs became more and more conventionalized or formalized (C and D), and today it is seldom possible to guess the meanings of such signs by detecting similarities between the sign and what it stands for. Thus, although this is not a form of alphabet writing, neither is it clearly pictographic.

But a more dangerous error than that discussed above--to return to the "abstract-concrete" discussion--is the view that the abstract is not quite an experience at all; and that it is, therefore, less desirable than what is not abstract. Of course we constantly abstract. This is true whether we speak with words or with pictures. Moreover, we must abstract. It has been offered as a major developmental refinement in phylogenesis that, as one goes up the phylogenetic continuum, there is an increasing independence of conceptual activity from the immediate sensory environment (see 14). Without this freedom, we could not think hypothetically, we could not bring remembrances of the past and anticipations of the future into our present psychological field so as to behave in terms of deferred gratifications. If we did not abstract, we could not generalize about that which was abstracted, and we would, therefore, be totally lacking in concepts. We would lack speech. We would lack culture. We would lack all accumulative knowledge. We would, in short, be non-social, hence non-human. The point is that concreteness is not uncontingently and per se a desirable thing. The desirability of encoding verbally, on the one hand, or pictorially on the other depends upon the effectiveness of the resultant message in the

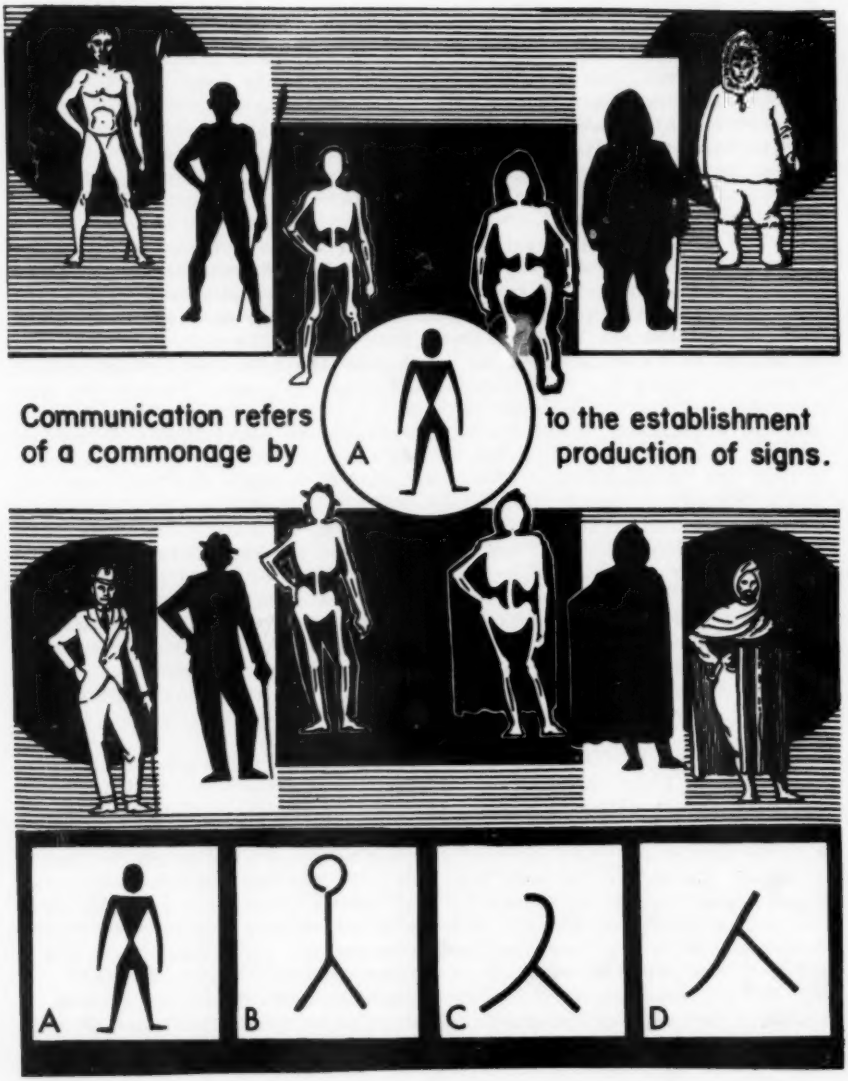

Figure 1. A pictorial-verbal abstraction ladder

communicative process. The effectiveness of any audio-visual message can be determined only relatively and contingently. Whether audio-visual or other means of encoding makes for the most effective communication depends upon such critical variables as the topic of the message to be encoded; pupil characteristics such as age, intelligence, interests, etc.; and teacher idiosyncrasies.

However, for purposes of illustration, let us unqualifiedly accept the view that learning that is based on concrete experience is better than that based on abstract experience; and let us further assume that our topic is mankind. Since our maxim is "the-more-concrete-the-better," we wish to involve as many senses as possible, and we wish to involve them as realistically as possible. We might, therefore, use animated wax statues that talk and smell. Now in all this concreteness, should we use a wiggling Marilyn Monroe with aphrodisiac perfume, a stumpy legged Toulouse-Lautrec reeking of absinthe, a standard average American male, a Piltdown man, or an oriental female? Most of us will agree, I believe, that in dealing with a highly abstract concept, highly abstract symbols have higher fidelity for the purpose than do more concrete symbols. It is no answer to urge the use of these icons and icons of all other varieties of man as well, for man's finite mind is too little and his iconic coding abilities are too limited and slow.

This viewpoint, which I have tagged "the-more-concrete-the-better principle," most clearly lacks exceptionless validity. At best, it is a highly gross generalization whose validity is a function of such critical factors as the abstractness of the referent category the teacher is concerned with. It is for just this sort of reason that I urge that whatever else we may wish to require of a conceptual rationale, the rationale chosen must be one that constantly directs our thinking to a consideration of the contingencies determining the relative effectiveness of symbols of varying degrees of abstractness. In the following section I shall present the outlines for such a rationale. A formal and, I believe, useful definition will then be seen to follow directly and inevitably from this conceptual rationale.

A Suggestion for a Conceptual Rationale

A communications orientation in which the concept of communication is severely delimited and the "audio-visual" modifier is defined, not generically or in its central meaning but, rather, as it has been traditionally implied, can serve our needs. First, the concept of communication must be narrowed.

Broadly conceived, communication signifies the establishment of a commonage. In this sense, warm and cold proximate radiators communicate, for they establish a commonage in terms of temperature.

Communication may also refer to the establishment of a commonage between geographically separate points in space, as in the transport of goods. In the mathematical theory of communication as put forth by Shannon and Weaver (25), room is made for machine-to-machine communication, but not for meaning.

These three conceptions of communication, representing three different types of commonages, are illustrated in Figure 2. The largest of the circles in this figure presents a fourth conception of communication. Here communication is shown as a commonage created by the transport of sign energies. The various levels within which commonages can be created by the production of signs are also shown.

The concept of sign. The commonage of greatest concern to the audio-visual field is a commonage between nervous systems, and the establishment of this commonage is dependent upon the production of signs. Our concern, consequently, is with the transport of energies, but not all energies--not, for example, the energies involved in my previous mention of communicating radiators. Our concern, rather, is with that class of energies that fall within the category designated as "sign energies." I shall follow Morris (22) and Cherry (6), therefore, and define "communication" as the establishment of a commonage between nervous systems by the production of stimuli that classify as signs.

For a physical energy to classify as a sign it must be capable of traveling between nervous systems. Said another way, it must be capable of exciting some receptor surface. Many non-sign energies meet this requirement, and so another criterion is necessary in order to set signs apart from other stimuli.

Some physical energies that meet the above requirement affect the stimulated organism directly or immediately (as this term is used in opposition to mediately). No mediating processes are necessarily involved, in other words; and it is perhaps not too crude to state that in this instance the stimulus means the object that gives rise to the stimulation. Other energy patterns signify something besides themselves, and, most significantly, this "something else" is the thing of importance. This latter class of energies, sign energies, stands for, or takes the place of, other stimulus patterns (i.e., other things or ideas). Such energies are said to sign-ify, and the importance of the concept "sign" is just that, signs sign-ify, or stand for, or direct behavior with regard to, something else, something that is not at the moment a stimulus (see 22). A sign-using organism is thus freed from the control of the immediate physical environment, for such an organism can control and guide himself and others by means of signs which he can himself produce with ease; and he can behave in reference to these signs as he would toward instances of what these signs stand for were such instances directly available to his senses. Signs thus make it possible to deal in an instant with things spatially and temporally distant; to bring the future and the past into the present psychological field; and to behave in terms of anticipations of far removed consequences.

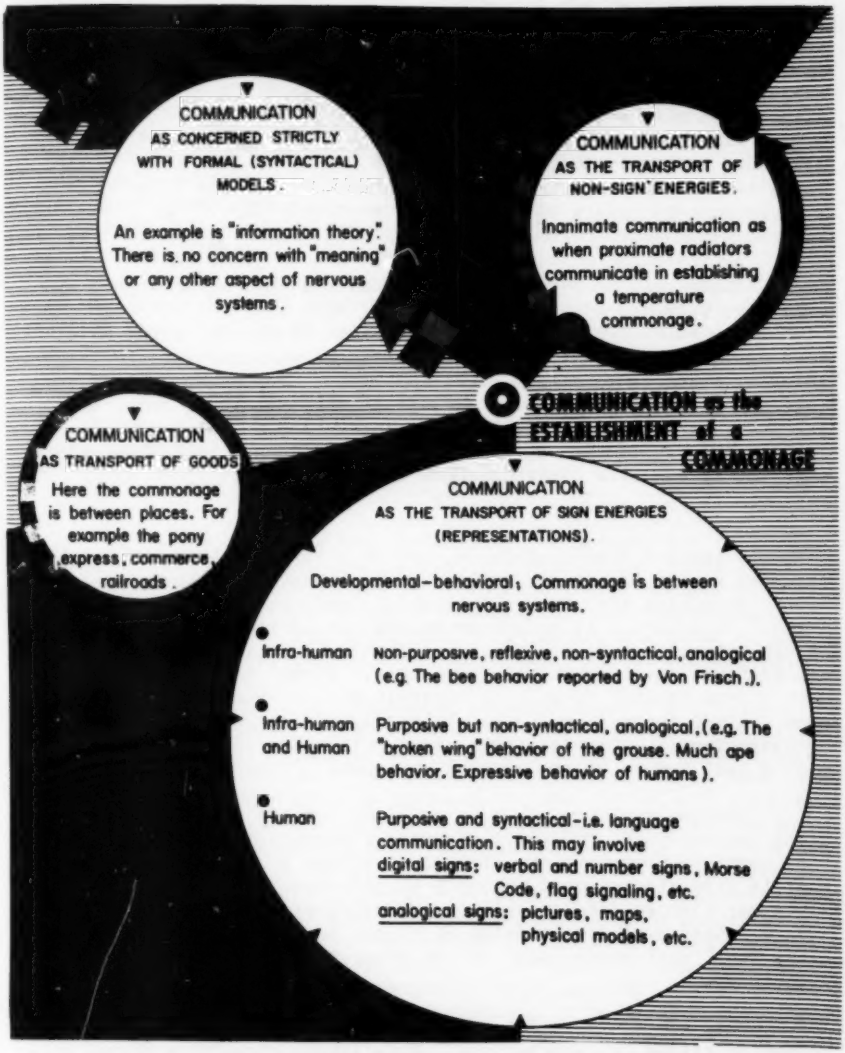
COMMUNICATION
AS CONCERNED STRICTLY WITH FORMAL (SYNTACTICAL) MODELS.
An example is "information theory." There is no concern with "meaning" or any other aspect of nervous systems.
COMMUNICATION
AS THE TRANSPORT OF NON-SIGN ENERGIES.
Inanimate communication as when proximate radiators communicate in establishing a temperature commonage.
COMMUNICATION as the ESTABLISHMENT of a COMMONAGE
COMMUNICATION
AS TRANSPORT OF GOODS
Here the commonage is between places. For example the pony express, commerce, railroads.
COMMUNICATION
AS THE TRANSPORT OF SIGN ENERGIES (REPRESENTATIONS).
Developmental-behavioral; Commonage is between nervous systems.
Infra-human
Non-purposive, reflexive, non-syntactical, analogical (e.g. The bee behavior reported by Von Frisch.).
Infra-human and Human
Purposive but non-syntactical, analogical, (e.g. The "broken wing" behavior of the grouse. Much ape behavior. Expressive behavior of humans).
Human
Purposive and syntactical-i.e. language communication. This may involve
digital signs: verbal and number signs, Morse Code, flag signaling, etc.
analogical signs: pictures, maps, physical models, etc.

Figure 2. Examples of some diverse interpretations of the concept of communication

Signs are potent determiners of behavior, for, although a sign is less interesting than what it stands for, it is more readily available and more easily manipulated than what it stands for. With the greatest ease--only the effort required in vocalizing--a sign-using organism can "move mountains," or at least signs can usually get Otto Aardvark to move his 200-pound frame when one so requests, whereas moving him physically would be a bit of a task. More generally, one can cause things to happen in either of two ways: by applying physical force directly, or by causing a change in the state of a sign-responding organism by the production of signs with which to stimulate such an organism. The utility of the latter is, I think, obvious.

Signs have been classified in numerous ways according to the momentary purposes of the classifier. I wish here to take cognizance of but two such classifications. The first designates signs as either natural or non-natural. A natural sign is a part of the larger thing or event or condition signified by it. For example, lush vegetation may be a sign of heavy precipitation, and a dead body, still warm, may be a sign that death was recent. The phrase "may be" rather than "is" points up the fact that no sign is perfectly reliable and it suggests that different types of signs vary in their reliability.

A feather head-dress as a sign of leadership status or weather flags as a sign of an approaching storm are not signs that are a part of the condition they naturally signify, and are therefore non-natural signs. Fortunately it is not necessary, as indicated by the examples of non-natural signs, to depend upon naturally existing sign-referent correlations in order to make reference. Indeed the human animal's most potent ability, and it is uniquely his, is his ability to produce some trivial event--e.g., a grunt--and by agreement with others of his language family, correlate this grunt with a non-trivial class of events that are to be the referent category of the grunt.

Because a natural sign is an aspect of the referent category signified by it, it follows that natural signs are like that which they signify. Water in the street, as a sign it has rained, is a sign that is like its referent category as concerns wetness. Non-natural signs may also be like their referent categories. A picture of a cow, even a schematized line drawing of a cow, is a sign of the referent class "cow" that shares some of the properties, or is like, its referent "cow."

This way of classifying signs is related to the second classification scheme of concern here. This latter classifies signs in terms of the degree to which a sign shares the properties of its referent category, but without regard to the sign's naturalness or lack of naturalness. A sign that is like the thing it signifies is designated as iconic. Signs not iconic are designated as digital. All digital signs, it is important to note, are independent of their physical parameters (e.g., pattern, size, or stimulus intensity) for their meaning. It makes little difference, in other words, whether one writes the word "cow," prints it, uses colored ink, Gothic type, large dark letters or small ones, or does all this in English, German,

or any other language. All these variations, and many many more, signify essentially the same referent category despite this variation. To a considerable extent, this is also true of iconic signs. A schematized line drawing of a cow can be made in an infinite number of ways. And photographs and even colored moving pictures signify very nearly the same referent category signified by the schematized line drawing, though in a more particularistic fashion.

But, of course, the iconic-digital classification is not dichotomous, and iconic signs vary widely in the degree of their iconicity. The higher the degree of iconicity possessed by a sign, the higher the degree of its dependence, for its meaning, upon the physical parameters of the sign. In the extreme, where a sign is so like an instance of its referent category that sign-referent confusion results, the "sign" is no longer responded to as a sign, but as itself the "real thing."

It is here that we get close to a formal definition of the audio-visual field--a definition in terms of signs. I previously defined "communication" as the establishment of a commonage between nervous systems through the production of signs; all that remains is to define the "audio-visual" modifier.

Communication, as a sign-established commonage, may be a sign-established commonage that utilizes either digital or iconic signs. Where iconic signs predominate, the communication is an audio-visual communication; where digital signs predominate, the communication is verbal (or some other type of digital) communication. This, in all its simplicity, is the way I would define audio-visual communication.

However, I would say something additional about the audio-visual field (as opposed to the concept of audio-visual communication). The A-V field surely cannot restrict itself by ignoring digital communications. And, of course, it never has. This should be true, however, not only because life is inseparable from digits, but because our professional purpose of growth through research will be furthered only if we concern ourselves with the comparative study of both kinds of signs. Only in this way will we learn the secrets of the special strengths and uses of iconic signs. I would therefore characterize the audio-visual field as that field concerned with the comparative study of the communicative effectiveness of iconic and digital modes of representation as these are functions of audience, message, and communicator variables. This would include comparing iconic and digital modes of signifying in a given instance, to determine the effectiveness of message units containing both kinds of signs--as most would--but varying the digital/iconic ratio as a function of the above variables.

A conceptual rationale for the audio-visual field is implicit in the above; and it is based upon the peculiar strengths (but not uncontingent strengths) of the icon. It is interesting, in this connection, to find the semiotician Charles Morris speaking very much as an audio-visualist might when he states: "The general importance of the

icon follows from its nature: the interpreter highly activates in himself his dispositions to respond, and can by the study of the icon acquaint himself with certain properties of what is signified . . . . [The icon] can be a powerful aid, by its concreteness, in facilitating any kind of sign-process directed to any purpose for which signs can be used." (22:192)

Unfortunately, an understanding of the precise nature of the relevant contingencies referred to awaits the findings of research yet to be performed. This research will be far different in nature from that which has so far dominated the field, for surely it will be research that is not as preoccupied with media as with messages.

Implications

The major consequences of the orientation urged in this paper concern research, for the researcher, much more than the utilizer of audio-visual materials, needs to work in terms of more careful distinctions and definitions than heretofore. But what are the consequences of adopting the finer and more precisely drawn distinctions made in this paper when, as we have seen, the audio-visual educator has all along (at least in effect) urged the efficacy of the iconic sign for effective teaching? I believe it is this. In not making his references in the language of signs, but in the confused and vague language that referred to what was audible or visible; or what was projected or channeled through sundry optical, mechanical, and electronic linkages; or what was "concrete" in experience, the audio-visualist inevitably found himself on untenable ground and, as well, frequently faced with contradictions.

In referring to what was audible and visible, the audio-visualist meant to refer to only a portion of audio-visual messages, and yet he referred to all communication. In referring to the machines that funnel his messages, he felt uncomfortable to think that these very same machines could funnel verbal messages, including verbalisms, as easily as iconic messages. In espousing the concrete experience, he was often unaware of the dangers of pictorialism, of the power and utility of the highly abstract experience, and of the high noise/information ratio of the concrete sign when the referent of the sign was itself highly abstract. And most serious of all, crude conceptualizations like these have had the effect of masking a basic error in much audio-visual thinking. This is an either-or sort of thinking such as has produced fans or enthusiasts who extol the iconic sign while seeing only weaknesses in the digital sign.

Much that has been said here can be summarized and illustrated by reference to our compulsive and unenlightened approach to comparative media studies. A not uncommon finding in this type of study is that of "no significant differences." That such a finding should be a common one in comparative media studies is no surprise in light of

the characteristic of "sign" earlier discussed, where the point was made that a sign is largely independent of its physical parameters for its meaning.

The significance of a sign may, of course, be learned more readily if the sign has some of the characteristics of its referent category, and this is A-V's rationale in "nut-shell" form. But once the significance of a sign (whether verbal, pictorial, or whatever) is well learned, it does not stand to reason that the adequacy or reliability of the sign will vary measurably when compared in its various forms. For example, the word "stop" and an iconic representation signifying "stop," when in proper context as at a highway cross-roads, are equally adequate, true, and reliable signs as they function to guide the behavior of normal adult English-speaking drivers.

If our normal adult English-speaking driver were in Japan, however, his safety would be more readily assured if all such designations were made with iconic signs. After living in Japan a while, a driver would acquire additional signs for his safety, relief, edification, and pleasure; and the longer he lived there, the more astute he was, etc., the smaller would become the difference between verbal and iconic signs in their communicative efficiency.

Very simply, the point is that, while a physical energy complex capable of stimulating one's receptor end-organs gains sign-ificance (or sign status) by social reinforcement in instances where production of the sign is appropriate to its referent category-to-be, still this referent category quickly loses any "concreteness" it may partake of early in learning, for the learner soon learns to respond only to those qualities of "objects" in a given referent category that are invariant. This fact prompted Quine (23) to point out that memories are not traces of past sensations, but of past conceptualizations, and that past conceptualizations are mostly dependent upon verbalization.

Certainly our concern with media will not cease, but it will take a turn of the sort implied by McLuhan when he stated that "the medium is the message" (20). For, while McLuhan's metaphor is clearly false as concerns the purely digital sign, still it gains in "truth value" as it is applied to signs of increasing iconicity. For example, in printed messages it takes a poet's use of metaphor, simile, onomatopoeia, etc. to bring iconic modes of signification into what is usually thought to be an exclusively digital realm. The radio, however, makes possible mass communication through speech, and with speech is introduced a second avenue of communication, the expressive quality of the voice. This avenue provides important non-verbal meta-communicative cues for interpreting the verbal message. With television, pantomimic gestures and yet other iconic signs come even more into play to further modify the verbal, or other digital, message.

Since the different media have varying potentials for the transmission of iconic signs, the media have, by this fact, a

marked influence upon the message. Albeit somewhat metaphorically, the medium is indeed the message. Whatever the case may be, we must not ignore the fact that studying media per se, or signs independently of media, is like assessing the area of a rectangle by separately and independently contemplating the magnitude of its width and length. The nature of the media, as a mechanical or electronic linkage between nervous systems, imposes important limits on this crucial message variable of iconicity. But media characteristics only set limits, and a preoccupation with media may cause one to forget that there is nothing intrinsic to any medium which guarantees the values of "the audio-visual way."

On the other hand, adopting the view offered here that the audio-visualist is first of all an expert communicator and iconologist, one never looks at media except to ask concerning the limits a medium imposes upon the message the communicator would like to transmit. In view of the subject matter of the message and the known characteristics of the audience, the communicator must determine how to deploy his icons and his digits and then ask how a given medium limits or facilitates this strategy.

Summary Comment

If we accept a communication orientation, we define ourselves out of gadgeteering and into education. The fundamental concept becomes that of sign or message, not media. We do not disavow certain fundamental truths, well learned, that are the backbone of our field, for, in its inception no less than now, the audio-visual field's conceptual rationale has been the point of view here argued for, a point of view that stresses the efficiency of the iconic sign in the learning process. But the crudeness of our conceptions has sometimes caused us to urge the uncontingent worth of the icon and has thus perverted this basis for action. For example, we have been frightened by the wolf "verbalism" while gobbling the poisoned chicken "pictorialism." To speak primarily in terms of machines or gadgets while neglecting messages is equally a perversion of this rationale.

While research concerning the contingencies determining the relative efficiency of iconic and digital signs for varying purposes remains to be worked out, the very nature of iconic and digital signs suggests some general hypotheses for test.

For example, iconic signs would seem especially effective with younger audiences, in the teaching of new referent categories, in cross cultural communications, in communication with non-captive audiences (because of the icon's presumed dramatic impact), and with pupils with below-average intelligence. (This latter should not lead one to conclude that iconic signs are unimportant in the ivory towers of great brains. Einstein, for example, had to desert verbal codes

and utilize iconic imagery in breaking through the iron thongs of verbal language at points where the latter categorized the world in an intolerable way.)

Iconic signs would be presumed to be generally more reliable than digital signs. They would be especially effective in persuasive and poetic discourse, though more difficult than digital signs to encode.

Digital signs are speedily encoded. They are especially useful in dealing with what is hypothetical or can only be imagined. Coding is finer, but it is discontinuous and bound to a time line in the case of digital signs. Iconic signs, since they share properties with their referent categories, should ordinarily be learned more readily than digital signs. They could then be used, in turn, to teach digital codes. This is, in fact, what Richards et al. have done in their Spanish Through Pictures (24), where Spanish is taught in the manner of first language learning, with icons substituting for all English words. It is worthy of note here that such a procedure would not work nearly so well if the syntax of Spanish and English were not similar; and this brings out an important point. While icons are older in human language development than are digits--man having progressed in the development of his non-spoken language from icons (pictographs) to ideographs and finally to alphabetic writing--we are still growing in our realization of the special utility of icons. But to effectively exploit iconic modes of representation requires, first, a careful knowledge of the syntax of iconic language. This deserves intensive study by audio-visualists who already intuitively understand much about this problem, but who know that the media were created to funnel messages and that messages were not made to fill the media.

References

1. Allen, William H., "Audio-visual Communication," Unpublished material prepared for the Third Edition (1960) of the Encyclopedia of Educational Research, The Macmillan Co., New York.

2. Arieti, Silvano, editor, American Handbook of Psychiatry, Basic Books, Inc., New York, 1959, 2 vols.

3. Berlo, David K., The Process of Communication, Holt, Rinehart and Winston, New York, 1960.

4. Brown, James W.; Lewis, Richard B.; and Harcleroad, Fred F., A-V Instruction Materials and Methods, McGraw-Hill Book Co., New York, 1959.

5. Brown, Roger, Words and Things, The Free Press, Glencoe, Ill., 1958.

6. Cherry, Colin, On Human Communication, John Wiley and Sons, Inc., New York, 1957.

7. Dale, Edgar, Audio-Visual Methods in Teaching, The Dryden Press, Inc., New York, 1954.

8. English, Horace B., and English, Ava C., A Comprehensive Dictionary of Psychological and Psychoanalytical Terms, Longmans, Green and Co. Inc., New York, 1958.

9. Farnsworth, Paul R., The Social Psychology of Music, The Dryden Press, Inc., New York, 1958.

10. Finn, James D., "Direction in A-V Communication Research," Audio-Visual Communication Review 2:83-102, 1954.

11. Finn, James D., "Technology and the Instructional Process," Audio-Visual Communication Review 8:5-26, 1960.

12. Gerbner, George, What Specific Contributions Can Be Drawn from the Social Sciences as Content for the Professional Education of the General Audio-Visual Specialist, Paper read at the DAVI Invitational Seminar, Cincinnati, 1960.

13. Hare, Paul; Borgatta, Edgar F.; and Bales, Robert F., editors, Small Groups, Alfred A. Knopf, Inc., New York, 1955.

14. Hebb, Donald O., and Thompson, W. R., "The Social Significance of Animal Studies," in Handbook of Social Psychology, edited by G. Lindsey, vol. 1, pp. 532-551, Addison-Wesley Publishing Co., Inc., Reading, Mass., 1954.

15. Hoijer, Harry, editor, Language in Culture, University of Chicago Press, Chicago, 1954.

16. Hull, Clark L., "The Hypothetico-Deductive Method," Psychological Theory, edited by M. H. Marx, pp. 219-232, The Macmillan Co., New York, 1951.

17. Kepes, G., Language of Vision, P. Theobald and Co., Chicago, 1944.

18. Langer, Susanne K., Philosophy in a New Key, The New American Library, New York, 1942.

19. Lemler, Ford L., "It's No Sin to Be a Practitioner," Audio-Visual Instruction 5:69, March, 1960.

20. McLuhan, Marshall, What Are Some of the Predicted Developments and Trends in the New Media and in Communication Theory That Should Affect Professional Education in the Audio-Visual Field, Paper read at the DAVI Invitational Seminar, Cincinnati, 1960.

21. Modern Communication: Home Reading Guide, Encyclopaedia Britannica, Inc., Chicago, 1955.

22. Morris, Charles W., Signs, Language and Behavior, Prentice-Hall, Inc., Chicago, 1946.

23. Quine, Willard Van Orman, Word and Object, The Technology Press and John Wiley and Sons, Inc., New York, 1960.

24. Richards, I. A.; Metcalf, Ruth C.; and Gibson, Christine, Spanish Through Pictures, Pocket Books, Inc., New York, 1953.

25. Shannon, Claude E., and Weaver, Warren, The Mathematical Theory of Communication, University of Illinois Press, Urbana, 1949.

26. Stevens, S. Smith, "Psychology and the Science of Science," in Psychological Theory, edited by M.H. Marx, pp. 21-54, The Macmillan Co., New York, 1951.

TOWARD EDUCATION BY AIRBORNE TELEVISION

by

Mendel Sherman

In answer to the question "Why education by airborne television?" the Midwest Program on Airborne Television Instruction gives the following answer:

"The nation's schools and colleges face the dual challenge in the coming years of educating far more students and giving each student a much better quality education than ever before."

Educational expenditures will have to increase, and it takes more money to solve the problems posed by this challenge. It requires important innovations that will increase instructional effectiveness and improve the relevance and quality of the curriculum.

Only a fundamental breakthrough in education, as sweeping as past breakthroughs in science, industry, and agriculture, can provide the needed boost in educational quality throughout the curriculum and throughout the country at a cost that can be met. Television represents one powerful new tool which can help schools and colleges develop these innovations. Like movable type and the printed page, however, television is simply a medium of communication. Its utility to education will depend primarily on how wisely it is used, on the quality of what is communicated, and on the way in which television instruction is integrated with other learning experiences in the school.

The Midwest Program on Airborne Television Instruction represents a promising opportunity to honor television and to bring a higher quality of education to millions of youngsters in large and small communities alike more quickly and at less cost than by any other means available.

Television also can lift many burdens from the classroom teacher and allow the teacher to work more intimately in individual and group learning situations with the students. Used at its full potential, television also may permit salary increases for school faculties as their duties are redefined and more nonprofessional chores are shifted to assistants and internes.

This summer, from June 27 through July 1, Indiana University provided sponsorship to one of 18 workshops being held on the campuses of the area resource institutions for the Midwest Program on Airborne Television Instruction (MPATI). In this five-day workshop, two days

were devoted to conferences and the remaining three days were given over to workshop activities. The basic purposes of the workshop were:

1. To acquaint school and community leaders with the plans of the Midwest Program on Airborne Television Instruction

2. To provide training in the use of television instruction in the classroom

3. To give information on the equipment needed for each school.

Approximately 600 persons registered as participants of the two-day conference. Of this number, 75 participated in the entire five-day conference-workshop program and 42 took the workshop for credit. The following report, written with the assistance of Richard Gilkey, of the Audio-Visual Center staff, should be of interest, both to those who attended and to those who did not, as a "running account" of a significant advance in the history of audio-visual communications and, in particular, of educational television.

The First General Session

The conference and the session were opened by L. C. Larson, and a welcome was extended to all participants by Robert W. Richey.

John E. Ivey, Jr., explained the "Conception of the Midwest Airborne Television Project" in terms of its basic structure, technical feasibility, educational orientation, and potential for the future. Beginning in January, 1961, a DC-6AB will telecast three hours a day on two UHF channels while flying over Montpelier, Indiana. The signal range will be about 300 miles. The first full year of six hours per day of telecasts will begin in September, 1961.

Teachers, ETV producers, and subject-matter specialists will meet for 10 weeks at Purdue University this summer to develop the courses to be offered.

This summer, area resources committees at 18 universities in the six states affected (Illinois, Indiana, Kentucky, Michigan, Ohio, and Wisconsin) will also begin activities to help develop sound plans for utilization of the programs and to provide professional and technical assistance to area schools. Mendel Sherman is serving as the Area Coordinator of the Indiana University Area.

The practicability of the program has been demonstrated from a technical standpoint both by the records of the Air Force weather flight crew and by the earlier Westinghouse experiments with "stratovision."

Educational quality will be stimulated by using teachers skilled in presentation of subject matter for the television programs and by providing the time and equipment available to do the best possible job. Thus, MPATI will offer a program few individual schools could duplicate. The TV teacher's role is that of a helper who permits the classroom teacher to have time to interact with pupils on an individual basis. It is on this latter premise that the educational soundness of this project will be judged.

Teaching economics represents another aspect of the project to be studied. At present we are concerned with the wave of pupils going through our schools, but the present wave will be followed by another and yet another before the year 2000 as each wave has its own children to further swell the school population. We must investigate now how this challenge is to be met. In televised instruction the larger the area covered, the lower the per pupil cost. Ground installations to cover the same area alone which Airborne expects to service would cost three times as much to build and service. At present, 600 schools appear interested in participating in the Airborne project. The question that must be answered in terms of economics is: Can there be a substantial boost in educational quality at lower cost than that available through group installations or non-use of television?

The last problem relates to educational management. Here a way must be found to operate across state lines, throughout the entire states, as if the organization were a single school system. Local control and planning leading to either a possible interstate contract or a six-state school corporation are two possible answers to this problem. The project is dedicated, however, to local control.

Evaluation is planned for at all levels from the beginning of the project to its completion. The future of this system offers potentials for national and international applications. Twenty planes could cover 92 per cent of the United States and, with each plane using six channels, 72 half-hours of instruction per day would be available. This program must use the present educational system as the basis for improvement; it must encourage schools to use a regular part of their budgets for research and development; and there must be a realization that television is just one phase of educational research designed to improve instruction at a cost we can afford and with the management we can provide. International Airborne TV offers the opportunity of overcoming this shortage in instructional staffs and of jumping the illiteracy barrier in underdeveloped countries.

In the second half of the session Herman L. Shibler presented the "Curriculum and Utilization Possibilities" of the Midwest Program on Airborne Television Instruction. Today, with an ever-increasing need for persons with education in science, mathematics, and foreign language, we are falling short in training them because of lack of qualified personnel. About 35 per cent of Indiana's high schools offer no foreign language program, partly because of the lack of

qualified teachers. Also, many teachers in the above three areas are unprepared to teach the classes assigned to them.

This program will bring qualified teachers to all classrooms, and the classroom teacher will be in an even more important position. Airborne Television's role will be that of a major teaching resource in which programs will reach the classroom two to four days a week for about 20 minutes a day. Present plans do not include the two other roles of educational television: (a) total teaching in which television does the entire instructional job except for evaluating pupil progress, and (b) supplemental television in which occasional planned programs are provided for the enrichment of a single class.

Criticism of the program has centered around a fear of standardization of curricula in all schools. This concern is most frequently expressed by laymen. Actually, this standardization is, in part, a fact already, since 80 per cent of the nation's schools use one or more of four or five texts in each grade level. The textbook is the most frequent determiner of the school's curriculum and these texts usually vary only slightly in their presentation of subject matter. Use of Airborne Television will demand the establishment of curriculum committees patterned after those in operation in city systems and the establishment of basic standards of pupil performance.

Utilization will be assisted by the area resource institutions and workshops. Next year longer workshops are planned. There will be no pre-service classes for prospective teachers; seminars will be held during the school year; area committees will involve community leaders in planning activities; and two persons from each area committee will serve on the regional committee.

At present, schools are advised to purchase a 21-inch standard VHF receiver and a UHF converter for channels 72 and 76. This is recommended since it will enable schools to use the sets for reception of commercially broadcast programs on VHF channels.

Both Mr. Ivey and Mr. Shibler were questioned by a panel of interrogators. Among the points brought out were the following:

1. High school courses are in the process of being approved by the State Department of Public Instruction.

2. The classroom teacher need not feel inferior to the television teacher, since television will give her more time to better educate the children in the areas in which they need extra help and will compensate for the areas in which she needs assistance.

3. The gearing of the program to the individual needs of the pupil will be a responsibility of the classroom teacher. Special programs for exceptional children will be offered.

4. Syllabi giving as much detail as possible will be provided in advance of the programs. Courses will follow the accepted patterns of content development. It will be beneficial in certain cases to have special equipment on hand to allow for follow-up activities related to the program.

5. It is hoped that kinescopes, films, or tapes of the programs will become as widely available as possible on a purchase or rental basis.

6. Teachers planning to use the programs should be required to participate in a workshop.

7. Class size recommendations will be a concern of the area resource committees. It is hoped that one demonstration school in each area will be equipped by the manufacturers of television equipment.

8. Science, mathematics, and foreign languages will be given the greatest emphasis in programming.

9. Public relations with parents and the community will be an area committee responsibility.

Second General Session

"Designing the Environment for Learning" was outlined in Harold Gores' presentation. Pressure is on today's schools to educate both more and better academically prepared pupils. There is no forseeable slackening in the upward trends of the population increase.

Our country's schools today are a series of equal size "boxes," each equipped with hard, smooth, kitchen type furniture of an antiseptic nature. The teacher and the classroom are solitary and cellular, with the teacher's role that of the "general practitioner." The team approach is beginning to break down this outmoded pattern, and the unique individual talents of the teacher are being utilized.

Trends in education today which have been affected or influenced by modern school construction are: subject matter placed on the basis of personal and group readiness; breaking away from fixed groups being together for an entire day; provision for places for individual study; seminar spaces for remedial and tutorial activities; spaces for large group instruction; use of teacher teams; provisions for flexible space through the use of operable walls; variable time patterns and non-use of bells; increased popularity of summer schools for above-average pupils (this will demand air-conditioning in many parts of the country); schools that are less "juvenile" and in which, consequently, the child realizes the importance of schools; increased use of teaching machines, language laboratories, and scrambled books;

move toward shell-shaped rather than box-shaped structures; cooperation between school boards in planning facilities; and the use of deployable space to permit classrooms to be shifted to meet variable enrollment problems.

In summary, Gores stated that the quest for quality leads directly back to the individual.

Third General Session

Kinescopes designed for primary grade language arts, junior high science, and senior high social studies were shown and evaluated by a panel, with George Johnson serving as chairman.

It was felt that the language arts program shown (on long and short i sounds) was too passive in its degree of pupil involvement; made attempts to "sugar coat" learning; was not a good example of educational television; did not provide motivation developed through felt need of a skill; did not teach skills in use or meaning of words; and used capital letters to spell out words. Television's value at this level was thought to be that of providing experiences that will serve as a background for skills development. Likewise, it was difficult to evaluate this program properly without first knowing the context of classroom use, the plan for the total series, and the materials prepared to assist the teacher in using the program.

The ninth-grade science program explaining the principles of direct current electric motors produced a divided opinion between the two evaluators. One of them indicated that it showed good teaching techniques, gave each pupil a front seat for the demonstration, and brought equipment into the classroom that might not be available otherwise. She noted, however, that there was a need for better use of close-ups. The second evaluator, on the other hand, felt that the descriptive nature of content placed it on seventh-grade level; that inexpensive motors easily available for classroom use by all pupils would have been a superior method of presentation, since science is based on actual experiences; and that several errors of fact were given that would need correction. The best sequence in the demonstration was the use of the three dimensional model of a motor.

The social studies lesson on the causes of World War I was the source of a divided reaction also. One person indicated that, although the teacher was a poised and fluent lecturer who made good use of maps, the content was text-oriented and did little a classroom teacher did not have resources to do. He would have preferred inclusion of the relation of non-Western areas to the causes of the war, and, in addition, treatment of the causes of war relating to anthropology, the industrial revolution, imperialism, and the sociology of war. Also slighted was Russia's role in the war and America's economic position in pre-war and post-war periods. He felt the film

lecture technique was best when it helped generalize problems, raised questions in pupils' minds, resulted from teamwork between the television teacher and the subject specialist, and made use of film clips as well as still pictures of the period. Another person thought the presentation superior to that possible by most teachers and, as such, would make a significant instructional contribution.

Johnson, in summing up the discussion on the three films, indicated criteria for production and use of educational television programs as follows:

1. The classroom teacher must assume a responsibility for motivating pupil learning.

2. Television has a greater potential to offer than the lecture-demonstration approach.

3. If television is developed and used in a spirit of teamwork, it will offer rich experiences to children.

Fourth General Session

"The Role of Television: A Challenge--The Education at Home" was presented by I. Keith Tyler. Two basic challenges to today's schools were stated. First is the pupil migration from one part of the country to another, from rural areas to urban areas and to suburban areas. This has accented the educationally underprivileged children found in many sections of the country (e.g. Negroes in the South and Puerto Ricans in the Eastern states). The second challenge is the demand of society for better education. Factors causing this demand are that more persons are providing services than are making goods and that leisure time has increased. These challenges are being met through helping boys and girls adjust to the future through learning the skills, attitudes, and techniques of problem solving rather than merely the facts. Adding to this problem are an increasing body of knowledge, more pupils, and the preparation of fewer teachers.

Technology can help, but we must learn to use what we have; for today only textbook use approaches the needed degree of effectiveness. Teachers now spend too much time in presenting facts and concepts and have little time for creative teaching and individual work.

Television offers education the benefits of immediacy, convenience, and involvement. It can also convey personalities, provide efficient and quality presentations, focus attention on significant aspects of education, make superior use of a variety of visuals, do these things classroom teachers lack equipment to do, provide physical and mental participation, and help motivate action or stimulate interest in broad or specific areas.

Presentations can be of the enrichment nature where the program brings a "slice of life" to the class for the teacher's use (e.g., great personalities, documentaries, and dramatic performances) programs may also be of the direct teaching nature in which the studio teacher takes the role of "showing and telling." The former is expensive and the latter is most inexpensive and common.

In the use of televised instruction the basic steps in learning must be followed by the television teacher and pupil, with each assuming his proper role. Presentation and motivation are best done by television, with the latter also in the role of the teacher. Practice and assimulation are teacher-pupil responsibilities assisted by a variety of instructional aids. Appraisal and application are the duties of teachers and pupils respectively.

By taking over much of the "showing and telling" burden from the teacher, television can allow the teacher to work with individuals.

W. Gerald Winfield continued with the challenge to television, but, in "Fundamental Education Abroad," he observed that the free world is engaged in a competitive revolution to release through a free system the information necessary to change the habits and attitudes which are required to raise living standards.

The communes of China have for the first time in Chinese history mobilized 40 million unused man hours of farm labor per year. This has been done by use of mass education, persuasion, and coercion. It has taken an effective agricultural system, in terms of production not time, and channeled some of the excess time into non-agricultural programs. We must be able to mobilize the same energies, but do so by free means.

Since the farms in the underdeveloped countries are small, many farmers must be reached to effect any real change in agricultural patterns. This is further complicated by the illiteracy of the peoples. These two factors combine to produce a "communication load" 10 to 500 times greater in these countries than in the United States.

In Asia, only Korea, Japan, Thailand, and the Phillipines have a high percentage of children in school. All other nations have less than half their children in school. To "break the back of the illiteracy problem there," we must return to the methods used in our own country on the frontier, in which persons with 10 to 12 years of school were teachers in the elementary grades. To assist these teachers we can furnish them with outstanding visual and textual materials.

At the same time agricultural improvements will come from illiterates who will produce the goods to provide the economic basis for education. Communications of a special type are needed to reach these illiterate persons, and all types of media will be necessary. Films, television, books, etc. will disseminate the information. Many new devices will be needed, such as the recently developed sunlight

filmstrip projector that can be used to provide the illustrations for inexpensively produced books. A biology course is now available in this format. Television will be important for moving knowledge to peoples of these countries within a pattern of freedom and consent.

The discussants and the speakers brought out the following ideas at the conclusion of the two addresses:

1. Meeting individual differences becomes less of a worry to persons following a period of use and observation of televised teaching.

2. A concern over the background required of the teacher under this enriched program offered by television raised the question of whether or not television requires better prepared classroom teachers. The response to this was that the teacher need not be an expert on all subjects, but should be able to lead pupils "through doors" to independent study.

3. Television was felt to stimulate both teacher self-improvement and curriculum improvement. In this connection, it was stressed that the classroom teacher should not try to mimic the television teacher but should develop skills of her own in teacher-pupil interaction.

4. Television was seen as an aid to establishment of common educational standards to meet the problem of population mobility.

5. Television's techniques of using a teacher rather than a narrator was felt to be superior, since it helped establish a personal link with the presentation.

6. Good instructional films were recommended, but it was felt that they were often poorly used and difficult for the teacher to integrate when needed. Television would help meet this problem of these fugitive materials.

7. Pupils must learn to learn from television and this depends in large measure on their teacher's attitude.

Fifth General Session

T. A. Wright, Jr., surveyed the "Problems of Reception" associated with Airborne Television. Telecasts will originate from a plane to permit a greater area to be covered by the signal. The initial cost will be less per pupil, and the operating cost will be about equal to ground installations covering the same geographic area. Channels 72 and 76 were picked to avoid interference with other television stations in the area. The use of one aircraft will give program continuity 80 per cent reliability, and the use of two planes will increase the reliability to 98 per cent.

Three factors were cited as influences on program reception, the first of which was transmission. The planes transmitting will use an antenna to direct the signal energy toward the ground; thus, the effective station power will be increased to about 50 kw. Receiving antennae will need to be located so as to avoid any "line of sight" obstructions with the plane. Reception is the second factor. Considerable gain in signal energy can be effected by the antennae, but long receiving lines can also reduce gains. Standard VHF sets with UHF converters will be preferred, but the audio system of the set should be of sufficient quality to have a low noise level and the power to reproduce the signal above this noise level. This is not available in low-cost sets. During December, 1960, a signal will be broadcast to check installation of receivers.

School equipment was the third factor discussed. Specifications will soon be available to schools on equipment standards. Where less than five sets are to be used, separate antennaes and receivers are preferred. For larger installations a single antenna and distribution system is required. The school sound system may be used for the audio-signal. If a school wishes to use both VHF and UHF programs, two separate antennae will be needed.

The panel discussion emphasized additional factors:

1. Projection television has not been recommended.

2. There needs to be one set for each 25 viewers.

3. If all rooms are wired for television, sets could be moved to each room.

4. Each school should test its antenna system for the signal quality in its location before installing distribution systems or television sets.

Sixth General Session

Robert E. Michael gave a demonstration of the use of a filmed television program, "What Happens in Hamlet," with a group of high school literature students. In his introduction, Michael related the study of Hamlet to the study of one's self; raised questions and issues of present-day concern, such as capital punishment and differences in religious doctrine; and made an assignment for the following day based on viewing the film. The follow-up discussion answered some of the questions raised by the pupils and wisely left others unanswered. In summary, Michael gave the group some very significant suggestions on reading Shakespeare, and "pointers" on their assignment.

Following Michael's introduction, use, and discussion of the film, a critique was presented by a panel and questions were asked by members of the audience.

The general content of this evaluation was that students must be motivated and must also have their attention directed at significant ideas if any teaching device is to be well used. Television's role in education then falls primarily back on the ability of the teacher to use the medium effectively with the class "to build springboards for ideas" that relate its content to their lives and knowledge.

Seventh General Session

Edgar Dale discussed the significant factors influencing the "Integration of Television with Other Instructional Materials." He cited America's historic problem of its energy outdistancing its brains. He pointed out that we now have created Airborne Television but we must find out how best to use it.

Factors creating difficulty in integrating television into our curriculum include the following:

1. We are adjusting to a dynamic, not a static, situation.

2. We are suffering from a hardening of the curriculum.

3. Our degree of specialization is increasing.

4. Persons fear integration into any total pattern.

5. We are not used to looking at our education as an integrated whole (in schools, in homes, and by parents).

6. We have failed to look at the total communication process.

7. We lack federal or state systems of education.

8. We have failed to use adequately the media now available.

9. It is difficult to think of the variety of patterns available for using television.

If television is to be effectively integrated into the curriculum, these conditions must be satisfied:

1. Television must be clearly defined in terms of meeting educational objectives.

2. Learning situations requiring help from the outside must be delimited. Television may assist instruction by:

a. Bringing rich dramatic experiences from which concepts and generalizations may be built

b. Presenting courses designed to teach newly developed knowledge.

3. The teacher's role in integrating television depends upon her self-view of her own role as:

a. Presenter of information

b. Explainer and clarifier

c. Evaluator (judges on similarity to original)

d. Stimulator of learning and creative interaction.

The creative process in learning involves both the presenting and the receiving of information. For education to be more than additive, integration should not center on integrating materials but, rather, on integrating the learner with the materials.

In summary, Dale concluded with four basic points relating television instruction with teacher qualities:

1. The teacher must think of herself as a guide to pupil exploring of new fields of study.

2. The teacher must stimulate and enhance taste.

3. The teacher must encourage pupil participation in knowledge and have individuals use a variety of materials, but not necessarily of the same materials.

4. Airborne Television will stimulate education in the Midwest, including essential curriculum studies. The study of the program before its inception is significant in educational enterprises.

Concluding, Dale stated, "Make no small plans; they have not the power to change men's minds." With educational television, as with all great inventions, there is new hope, but we must be both statesmenlike and critical in its use and development.

Eighth General Session

A symposium and group discussion brought out the "Implications of Airborne Television for Education in Indiana." Significant points developed in this presentation included the following:

1. There is need for a curriculum consulting service for each geographic area.

2. Television will require flexible teachers and administrators.

3. The project will widen the horizons and raise the standards of education.

4. Television will overcome the barrier imposed by books on dissemination of new printed matter.

5. Children will receive more equal educational opportunities, regardless of their socio-economic status in the community.

6. Plans for experimental courses are being approved and evaluated by administrators.

7. Problems to be solved include facilities, the setting-up of large group classes, discipline in classes, the teaching of skills that are required for learning in lecture classes, integration of television into the whole curriculum, redesigning of the curriculum, and class scheduling.

8. School boards are interested in this project, but, since large geographic areas are covered, the school boards must discover what their roles will be.

9. Flexible budgets must be established, and they should allow for experimentation by local schools.

10. The administrative design of the program will be decided by the general public.

11. Television and other audio-visual materials are aids to instruction.

12. In the Kentuckiana television project and in the television program of the Philadelphia schools, television has increased the use of other audio-visual materials.

13. Before beginning a television project, it should be tried out under favorable conditions, with careful selection of grade level, departments, and teachers who are favorable to the program.

14. Now is an ideal time for this experiment in Indiana, since school reorganization is taking place.

15. Budgeting for television does not differ from budgeting other school needs.

16. Schools should not expect too much outside financial help, but they may hope for it.

17. Decisions should be made on the basis of the minimum amount of money needed; then this amount can be raised later, rather than lowered.

18. Television development should strengthen the rest of the instructional program, not weaken it by directing needed funds away from other basic needs.

19. Tax rates should not be increased to support television until the public has an understanding of how the new medium functions.

20. In considering sources of funds for television, the following need investigation:

a. NDEA grants

b. Community funds outside tax sources

c. Staff, space, equipment, and maintenance requirements

d. Provision for local evaluation

e. Projected future needs

f. Justification of program in terms of better education.

21. Television will require both pre-service and in-service teacher education in terms of its uses, the use of other materials, the development of creative teachers skilled in working with individuals, the fostering of the ability to recognize when to use and when not to use television, the encouragement of intensive and extensive research programs in its evaluation, and the providing of help for teachers in preparing and using their own materials.

22. The State Department of Education is interested in the financing, production, and evaluation of this use of educational television.

23. Airborne Television is an experiment. After it has been given a fair trial, its contributions should be examined.

REFERENCES

1. Area Coordinator's Manual, edited by Mary Howard Smith, Educational Services Division, Midwest Council on Airborne Television Instruction, Purdue University, Lafayette, Ind., August 20, 1960, 70 pp.

2. Design for Educational TV, Dave Chapman, Inc., Industrial Design for Educational Facilities Laboratories, New York, 1960, 96 pp.

3. Manual for Classroom Teachers Using Television, The Purdue Research Foundation, Purdue University, Lafayette, Ind., 1960, 107 pp.

4. Midwest Program on Airborne Television Instruction, Headquarters, Midwest Program on Airborne Television Instruction, Purdue University, Lafayette, Ind., 1960, 28 pp.

5. MPATI Newsletter, Memorial Center, Purdue University, Lafayette, Ind., Summer, 1960, 4 pp.

6. MPATI Operating Manual, Midwest Council on Airborne Television Instruction, Purdue University, Lafayette, Ind., May 1, 1960 (rev., July 1, 1960), 79 pp.

7. Recommended Specifications for Equipping of Schools, Educational Services Division, Midwest Program on Airborne Television Instruction, Purdue University, Lafayette, Ind., 1960, 15 pp.

8. Selection and Utilization of Demonstration Schools for the Midwest Program on Airborne Television Instruction, MPATI Headquarters, Purdue University, Lafayette, Ind., 1960, 2 pp.

BULLETINS IN THE FIELD OF EDUCATION
INDIANA UNIVERSITY

The Bulletin of the School of Education, Indiana University, was first published in 1924 and has appeared regularly since that time. A complete list of bulletins may be obtained from the School of Education upon request. The studies included in the present volume and in the two volumes immediately preceding it in date are listed below. Unless otherwise indicated, these may be obtained for $1 each from the Indiana University Bookstore, Bloomington, Indiana.

Volume 34 (1958)

1. Franzén, Carl G. F., Foreign Language in the Curriculum, 30 pp.
2. Mercille, Margaret G., Undergraduate Workshop in Elementary Education, 40 pp.
3. Strom, Ingrid M., The Role of Literature in the Core Curriculum, 60 pp.
4. Popham, W. James, and Standlee, Lloyd S., Out-of-School Activities and Professional Performance of Teachers, 38 pp.
5. Fay, Leo C., Improving the Teaching of Reading by Teacher Experimentation, 104 pp.
6. Standlee, Lloyd S., and Popham, W. James, Preparation and Performance of Teachers, 48 pp.

Volume 35 (1959)

1. Wright, Wendell W., and Jung, Christian W., Why Capable High School Students Do Not Continue Their Schooling, 78 pp.
2. Hughes, Otto, The Role of the Campus Laboratory School, 48 pp.
3. Research Studies Related to the Improvement of Education in Thailand, 66 pp.
4. Batchelder, Howard T., Report of a State-Wide Study of the Public Schools and Teacher Education in Indiana, 82 pp.

5. Church, Harold H., and Lewis, Melvin S., An Appraisal of the School Surveys Conducted by the School of Education, Indiana University, 66 pp.

6. Barr, W. Monfort; Church, Harold H.; Stapley, Maurice E.; and McGhehey, Marion A., School District Reorganization in Indiana, 136 pp.

Volume 36 (1960)

1. Clayton, A. Stafford, editor, John Dewey in Perspective, 44 pp., $1.25.

2. Klinge, Paul E., A University Summer Program for Gifted Science Students, 54 pp., $1.25.

3. Turner, Richard L., and Fattu, Nicholas A., Skill in Teaching, A Reappraisal of the Concepts and Strategies in Teacher Effectiveness Research, 40 pp., $1.25.

4. Welch, Ronald C., Promising Practices in Elementary School Mathematics, 54 pp., $1.25.

5. Strom, Ingrid M., Research in Grammar and Usage and Its Implications for Teaching Writing, 23 pp., $1.25.

6. Bern, Henry A., editor, New Directions in Audio-Visual Communications, 83 pp.

DOCTORAL THESES COMPLETED IN THE SCHOOL OF EDUCATION IN 1960

Ade, Walter Frank Charles, Voltaire on Education

Al-Karbouli, Hamad D., Interference as a Function of Certain Factors in Learning Two Foreign Languages Contiguously

Arment, Hollace Elbert, A Study by Means of Spectrographic Analysis of the Brightness and Darkness Qualities of Vowel Tones in Women's Voices

Aziz, Aziz Shallal, Considerations for the Expansion of the Audio-Visual Program in the Iraqi Educational System

Bagford, Jack, A Comparison of the Goal Maturity Scores of Selected Groups of High- and Low-Achieving Sixth-Grade Students

Baumgart, Norbert K., An Evaluation of Descriptive Profiles as a Method of Predicting Academic Achievement

Boyd, John A., High School Newspaper Advisers in Indiana and Their Instructional Program in Journalism

Breithaupt, Jack F., The Effects of Intelligence and Orthopedic Handicap upon Selected Personality Variables

Brooks, John W., Attitudes and Opinions of Negro Pupils and Their Parents Concerning Shortridge High School

Brown, Robert Michal, Programming a Film Series: A Case Study Analysis of Factors Affecting the Cost of Selected Methods of Distributive Film Series

Chayaniyayodhin, Seela, A Study of the Principles of Teaching Language Arts and Their Implication for Teacher Education in Thailand

Church, Wayne Cleveland, An Evaluation of Status and Functions of Research Bureaus in Public Schools in Cities of 50,000 to 250,000 Population

Cronk, John G., An Analysis of Certain Areas of the Administration of Extracurricular Programs in Selected Six-Year High Schools in Indiana

Cutliff, Lucy Reed, A Comparison of the Attitudes of Above-Average Drop-Outs and Above-Average Non-Leavers of Indiana University

Drumm, Enoch Spencer, Public School Discipline in Cultural Perspective

Edmondson, James H., Recommended Procurement Practices for Colleges

Farrag, Osman L., A Comparative Study of the Adjustment Problems of Egyptian and American High School Students, with Implications for Guidance

Fleming, Malcolm L., An Experimental Exploration of Three Communication-Strategies for Increasing the Predictability of Pictorial Cue: Verbal Response Relationships

Fuller, William S., Space Allocation, Pupil Capacity, and Unit Costs of 20 Selected Public Secondary School Buildings Constructed in Indiana During 1948 to 1958

Gibbons, Helen Elizabeth, Factors that Influence the Excellence of Supervising Teachers in Business Education

Gousha, Richard Paul, A Suggested Revision of the Indiana School Support Formula to Encourage the Development of Adequate Local School Districts

Hamm, Russell L., Core Curriculum as Conceived by Junior High School Teachers of Core and by Junior High School Principals of Schools That Have Core Programs in the State of Minnesota

Harper, Leo Merle, The Ability of Third-Grade Children to Interpret Graphs

Harris, Helen Virginia, The Perception of the Counseling Climate with Delinquents by Counselors at Indiana University Majoring in Education, Sociology, Psychology, and Social Service

Harris, James Braxton, Behavioral Goals of General Education in the Regionally Accredited Public Senior High Schools of North Carolina

Headd, Pearl Walker, An Evaluation of the Effectiveness of Tuskegee Institute's Basic Course in Audio-Visual Education, with Recommendations for Improvement

Heath, Earl Joseph, A Study of Attitudes Toward Teacher-Pupil Relationships Utilizing Q-Technique with the Items of the MTAI

Henzie, Charles A., Amplitude and Duration Characteristics of Snare Drum Tones

Hernandez, Delores F., Developing Needs of Science Education in the Republic of the Philippines

Hymon, Mary Watson, The Awareness and Perception of Adult Education as Factors in the Motivation of Adults on the Lower Socio-economic Levels

Jiminez, Frine F., Recommended Standards for Standardized Testing in the Division of City Schools, Manila, Philippines

Jones, Hebert M., A Defensible Foundation Program and Distribution Formula for Indiana

Kamudamas, Virat, A Proposed Program of Counselor Training for the College of Education, Bangkok, Thailand

Kaufman, Mae Elizabeth, Some Problems of Negro Teachers Related to Integration of Pupils in Public Schools

Knapp, Austin Carlyle, Analysis of Trends in Selected Graduate Audio-Visual Education Programs

Kruatrachue, Foongfuang, Thai and English: A Comparative Study of Phonology for Pedagogical Applications

Lee, Anne M., A Study of Married Women Students at Indiana State Teachers College, 1958-1959

Lee, Carson, A Study of the Effects of Counseling in Reducing the Number of Problems Indicated by High School Freshmen and Seniors

Lundstrum, John P., An Inquiry into the Proper Role of the Social Studies Teacher with Reference to the Use of Controversy

McKinley, John, A Participation Training Program in a Mental Hospital: An Experiment in Adult Education

Major, Dorothy M., Career Preferences and Planning of High-Ranking Senior Students in Collegiate Schools of Nursing

Manicur, Alice R., Problem Areas and Acceptability of Student Behavior as Indicated by Residence Hall and Sorority Women at Indiana University

Meran, Robert Donald, A Study of the Professional Preparation of Industrial Arts Teachers in California

Miller, Frances P., An Analysis of Sixth-Grade Pupils' Thinking Regarding Their Solutions of Certain Verbal Arithmetic Problems

Murray, Merrill Russell, A Comparison of Selected Factors in the Pre-College Experiences of Those Students Who Dropped Out of a Technological Institution and Their Classmates Who Continued

Pruett, Rolla F., The Achievement in Mathematics and Science of Ninth-Grade Pupils in the Schools of Indiana

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